THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXX. No. 742.] LONDON, JULY 31, 1877. [29TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—12,000 cubic feet of gas per ton of coal; 28-candle gas; coke, 66·70 per cent.; volatile matters, 33·30 per cent. Coke of good quality.

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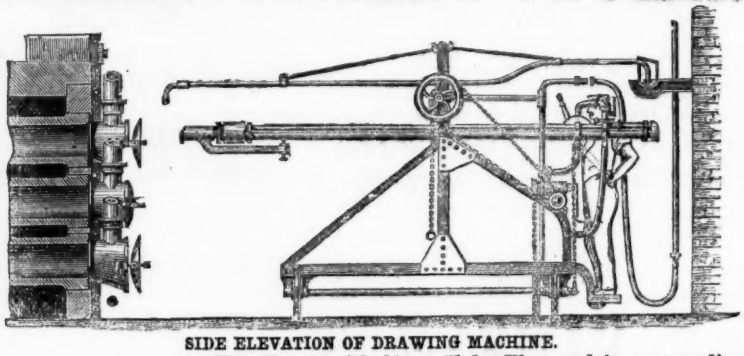
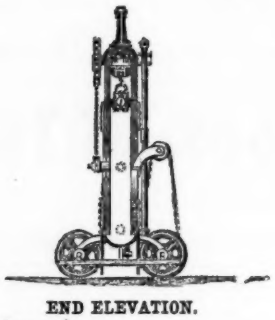


SIDE ELEVATION OF DRAWING MACHINE.



END ELEVATION.

(The Charging Machine will be Illustrated in next week's Advertisement.)

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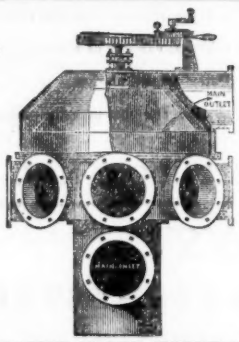
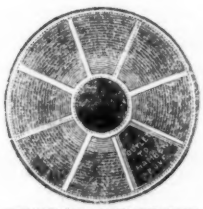
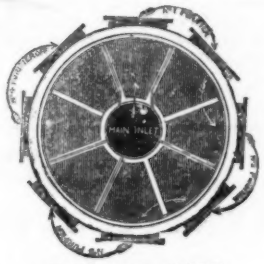


ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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SELF-ACTING REMOVABLE DIP-PIPE,

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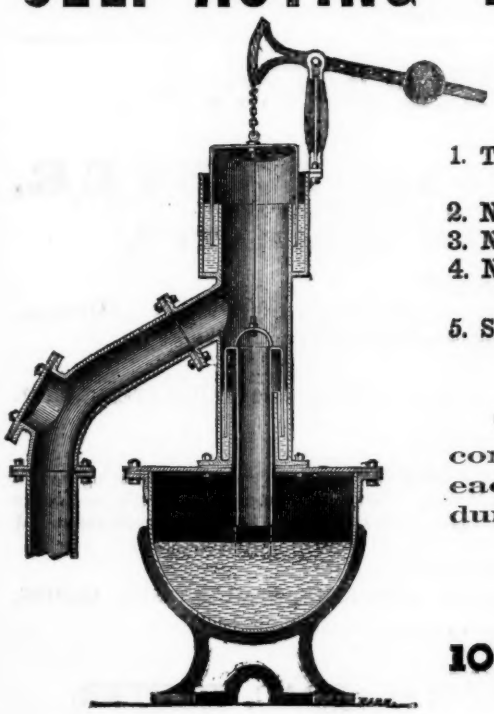

ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

These Dip-Pipes can now be supplied complete, except the flanched bend, for £4 each, which includes the charge for licence during the whole term of the patent.

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Who fix the Dip-Pipes, at a small Charge, when required.

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The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

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FRICTIONLESS DRY GAS-METERS,

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In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

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And every Description of Gas Apparatus.

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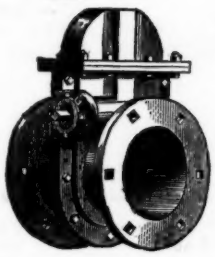
IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS.



List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.

These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

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STEAM ENGINES FOR DRIVING GAS EXHAUSTERS,

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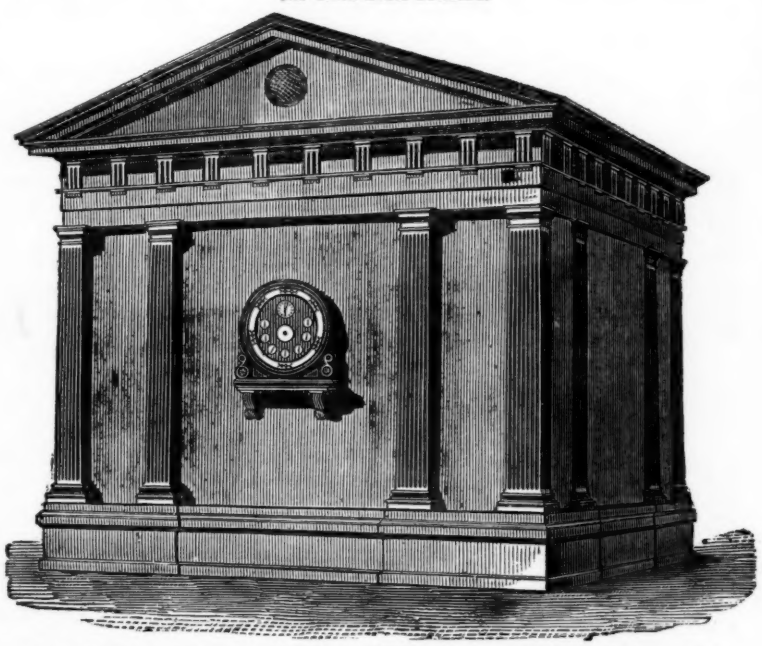

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BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS
Of all Dimensions for Gas-Works,
GLASS-HOUSE POTS & CRUCIBLES
Of every kind.
The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture.

"SELLARS' CEMENT"
PREVENTS WASTE OF GAS FROM RETORTS;
SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;
GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;
And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.
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THE GAS CEMENT WORKS,
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WILLIAM MACLEOD & CO.,
23 & 25, OSWALD STREET, GLASGOW.
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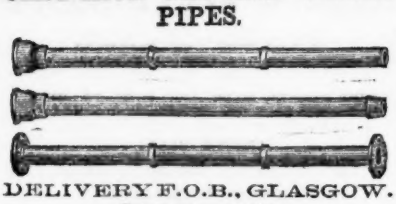
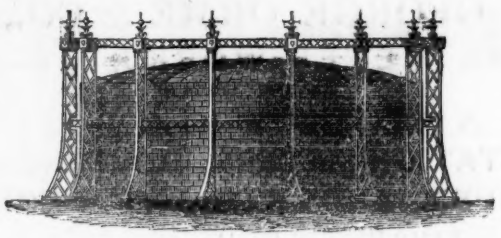


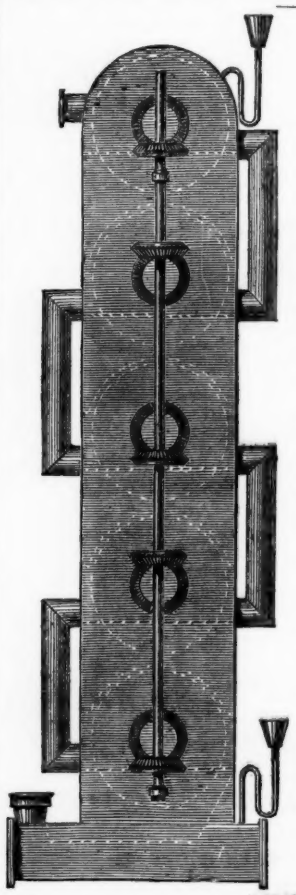
DELIVERY F.O.B., GLASGOW.
Prices on application.



THE HORSELEY COMPANY,
LIMITED,
TIPTON, STAFFORDSHIRE.
LONDON OFFICE:
6, WESTMINSTER CHAMBERS, VICTORIA STREET,
GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,
AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.

GEORGE ANDERSON,
GAS AND CONSULTING ENGINEER,
35A, GREAT GEORGE STREET,
WESTMINSTER, S.W.

ANDERSON'S
PATENT
COMBINED WASHER AND SCRUBBER.



TESTIMONY OF ITS ACTION.
The Gas-Works, St. Albans, April 27, 1877.
DEAR SIR,
Your Brush Scrubber has been in action here for four months.
It removes the whole of the ammonia from the gas, so that it will not discolour moistened turmeric paper.
The brushes cause no appreciable increase of pressure, and there is no repumping of liquor. Clear water run in at top, issues from the bottom fit to proceed to the sulphate-house.
It performs its work more efficiently than the tower scrubber I have, while only about half the height, and not one-fourth its weight or capacity.
My purifiers also last much longer before they are foul than they did previously.
I am, yours truly,
A. F. PHILLIPS.
G. Anderson, Esq.,
35*a*, Great George Street, S.W.

PATENTEE and MANUFACTURER of the following Inventions:—
RETORT SETTINGS—giving great Economy of Fuel.
STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES.
FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.
PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,
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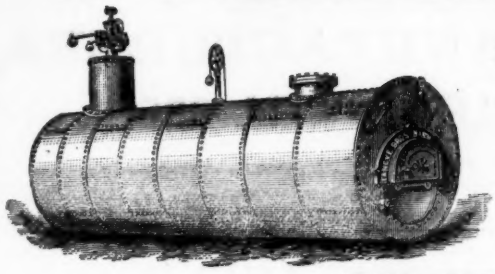
STEAM-BOILERS,



CORNISH,

LANCASHIRE,

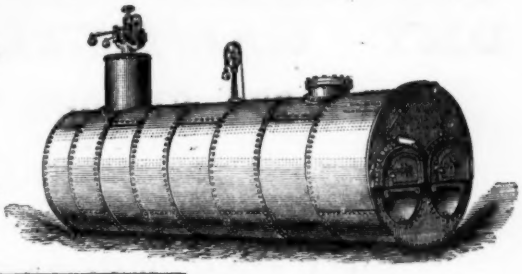
EGG-ENDED AND VERTICAL,

IN ALL SIZES,

AND OF

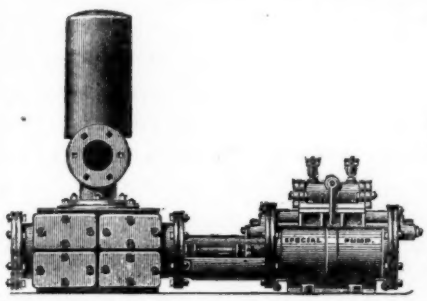
SUPERIOR QUALITY.

Prices on Application.



THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4*	2	9	815*	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,350*	50
7	7	12	9,750	50
10*	7	12	9,750*	65

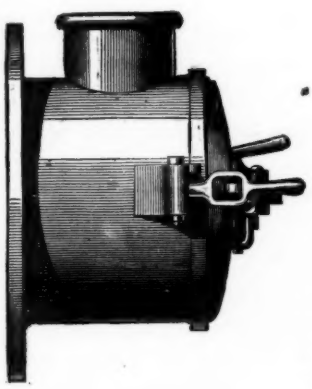


In use in 100 Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

200 Sizes made. Those in Table opposite are the leading Sizes for use in Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.



MORTON'S

Patent Self-Sealing

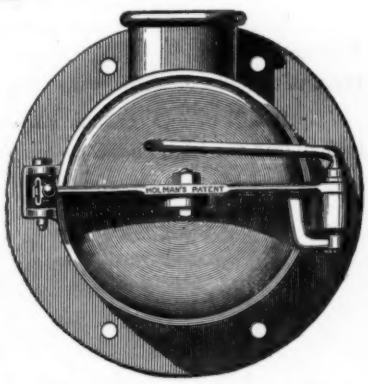
RETORT LIDS,

WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS, ANTI-FRICTION CATCHES, AND ECCENTRIC FASTENINGS.

Instantaneous Sealing effected. No Luting. No Duplicate Lids required. Holman's New Self-Sustaining Cross-Bar ensures freedom of joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), being now in use in nearly all the principal Gas-Works in London and the Provinces.



IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (commonly called the Chartered Gas Company), Beckton, North Woolwich.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them. I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly, (Signed) G. C. TREWBY.

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France) Devonport, Dronfield, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION TO

TANGYE BROTHERS & HOLMAN,

SOLE MANUFACTURERS,

LAURENCE POUNTNEY LANE, LONDON, E.C.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

TO GAS ENGINEERS AND MANAGERS.

It having come to our knowledge that a report is in circulation, spread by some unprincipled person or persons, that the cases of our larger-sized Meters are made of Galvanized Iron, we think it only fair to ourselves, and just to our customers, to say, that we never have used, in making any of our Meters, a single pound of *Galvanized Iron*, or any other *cheap* and *inferior material*, and this can be easily seen by opening any of them.

The cases of our large-sized Meters, from 20 lights and upwards, are all made of the very *Best Best Patent Alloy*, which is nearly double the price, and will last more than double the time, of some other material that has been and still is very largely used for the same purpose. And our experience, acquired by an extensive use of it for upwards of 30 years, enables us to say with confidence that no other metal in use for the purpose is so little liable to corrosion from the action of the gas.

We have now in use a Meter made in 1848, and therefore 29 years old, the case of which is made of Patent Alloy; the Meter is still in perfect order, and shows no signs of decay.

The utmost care is exercised by us in selecting none but the very best materials for all parts of our Meters; much of it is made *expressly for us*, as it is not possible to obtain it in the open market of the same superior quality.

The great fall in the price of all materials used in making our Meters has enabled us to give an increased discount, thus giving our customers the benefit of the fall. This we were bound in fairness to do, as we raised the price of our Meters four years ago, when the price of all metals went up.

It will be our constant endeavour, by using none but the best materials, and employing the most skilful workmen, to maintain the high character our Meter has hitherto borne.

WILLIAM PARKINSON & CO.

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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NOTICE TO SUBSCRIBERS.

BANK HOLIDAY.—*In consequence of the Bank Holiday next week, the* JOURNAL *will not be published till Wednesday, Aug.* 8.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 31, 1877.

Circular to Gas Companies.

THE "scare" may be said to be over. The prices of gas property have returned to what we may consider a normal state. For the moment the "electric candle" is extinguished, and, indeed, almost forgotten, so fast do sensational novelties pass from recognition. We have endeavoured, in past remarks, to show how ill adapted, at the best, the electric light is to supersede gas. In the first place, a large expenditure of force, and, consequently, of money, is spent on producing light, nine-tenths of which must be cut off to make it endurable. We speak, of course, of the invention as it is at present offered to us; but we have always led, and still lead, our readers to look for further improvements. Electricity, however, can only be employed as a means of illumination, and that is only one, and it may eventually be one of the smallest uses of gas. Waiting for details of expenditure, we think it may turn out that, under the inexorable law of the conservation of energy, the coal employed in driving the magneto-electric machine, and which, it must be remembered, is entirely consumed, will, while giving a large amount of light, only represent an equivalent amount, distilled in retorts, which affords a certain amount of light, but, at the same time, leaves residuals which are equal in value—that is, they make up the worth of the coal distilled. With our present knowledge, we are not inclined to believe that coal consumed to drive a magneto-electric machine does more useful work than the same amount would if distilled for gas-making. True, it may be made to produce more light, the greater part of which must, as we have said, now be wasted. But light is not the only thing wanted. It may be said, without exaggeration, that, apart from the actual application of gas for illuminating purposes, gas is unconsciously used almost as much to afford warmth as light. The "electric candle" leaves us all out in the cold.

We have dealt with "residuals," as we call them, before—they might be dignified by the name of "primary" products. Ammonia is an absolute necessity. We must have benzole and its immediate chemical relatives, and we know no other way to obtain them than by the distillation of coal. The time may come when gas will be considered the bye-product; but that coal will continue to be distilled, there can be no question. Gas shareholders may, therefore, take heart. Their property is safe for a generation or two to come. But still it behoves Gas Companies to be wise in time. Their plain duty now is to popularize the use of gas. There is room for an infinite extension of its use. Let those who rule over the destinies of Gas Companies look to it.

It was, of course, always obvious to us that it was possible to work auction clauses in such a way that no premiums would be realized, and that new issues of capital might be placed in the hands of existing shareholders. But it was no business of ours to explain how this might be done. We left it to the ingenuity of any companies who might be interested in the matter. It will, however, be seen in our "Parliamentary Intel-"ligence," that official, or officious, attention has been directed to the subject, and the result will be another addition to Standing Orders. Earl Redesdale will, to-night, move an Order, that in all future Gas Bills it shall be provided that new capital raised by the sale of shares or stock by auction shall be paid up within a limited period. When we come presently to publish the evidence given before the Committee of the House of Lords on the Waterford Gas Bill, it will be seen how this order has originated. The suggestion has been made that the share capital sold, and the premium realized, shall be made payable within three months of the date of the sale, and most likely it will be so enacted in the future.

Our readers know that the Corporation of Stoke are very desirous of acquiring the gas undertaking in their district. The Company are unwilling to sell, but, probably, in the long run, the undertaking will pass into the hands of the Corporation. It is with some amusement we read in the report of the committee who are conducting the negotiations, that one, and, perhaps, the chief, reason for desiring the acquisition is plainly put as follows:—

> Your committee cannot conceal from themselves the fact that a large expenditure of an unremunerative character will fall within a very few years on the ratepayers, and they believe the profit arising from the purchase of the gas-works will do much, if it does not remove altogether the burden that would otherwise fall upon the corporation.

It is a very cool thing to put the cost of unremunerative works upon the gas consumers of Stoke, and presently these may become alive to the injustice of such a proceeding.

The paid-up capital of the Gas Company is £34,000, and, in addition to this, profits have been expended on works, which bring up the total expenditure to £47,000. For this the Corporation propose to pay £85,000, which is twenty-five years purchase of maximum dividends, but only fourteen and a half years purchase of the profits made on the average during the past seven years. It seems probable that the bargain will be concluded on this basis.

The Town Council of Hanley have not succeeded in getting possession of the gas-works, but, in the endeavour to do so, they have run up a small bill for parliamentary expenses, amounting to £1860, which it will require a rate of threepence in the pound to pay off. The Town Council try to look pleasant over the matter, and have received the thanks of a local association of ratepayers. We feel bound to remark that the amount above mentioned is so much smaller than was to be expected under the circumstances, that we entertain a strong fear that other bills of costs will shortly be forthcoming.

We informed our readers that the Town Council of Hull had resolved on asking the Local Government Board to hold an inquiry as to the circumstances of the gas supply of their borough and district, which, we may admit, are somewhat peculiar. We said at the time that we knew of no enactment which would authorize the Board to interfere in the matter. A reply from the Board, to the same effect, was read at the last meeting of the Council, who afterwards passed a resolution instructing the Parliamentary Committee to take immediate steps to prepare a Bill for next session, to empower the Council to erect new gas-works, or to purchase or lease existing works. It was incidentally stated that the Corporation might at one time have purchased the undertaking of the British Company in that town for £46,000, but that it would now cost £346,000. There is, doubtless, some exaggeration here. We believe the British Company would refuse to sell at any price, and we are certain that Hull is far better off, with the gas supply in the hands of the Company, than it would be if it were furnished by the Corporation.

A singular accident occurred at the Devonport Gas-Works

last week. A tank to receive a new gasholder is being excavated in rocky ground, where it is necessary to blast. An unlucky shot, it would seem, hurled a large fragment into the air, and falling on the crown of a neighbouring holder, went through. The escaping gas, it appears, was driven by the wind to the retort-house, and became ignited. What is described as an "explosion" resulted, but we cannot make out from the report that anything like a real explosion happened. The gasholder is, of course, a wreck, but beyond that the damage done seems to be inconsiderable. A few scorched cabbages and pigs appear to be the worst results of the accident. We refer to it because we fear it may be quoted as a proof that the vicinity of gas storeage works is dangerous. Setting aside the exceptional circumstances of this accident, we wish to point out that nothing like an "explosion" occurred. A hole was made in a gasholder, and the gas mixed with air became ignited, and burnt over a rather wide area. No damage was occasioned to any other part of the works, and the greatest praise is due to the Manager, who, after the destruction of his holder, continued the lighting of the town with so little inconvenience to the inhabitants. We will not say that a gasholder cannot be exploded; but the circumstances under which such an accident could take place are almost inconceivable.

We may mention here that our report of the proceedings before the Select Committee of the House of Commons, on the Bills promoted by the Crystal Palace District Gas Company and the Chartered Company is now ready. The nature of these proceedings was such that a permanent and easily-accessible record of them would, we considered, prove of essential service to Gas Companies. Unhappily, the evidence is not so complete as we could have wished. Owing to some little misunderstanding, the chemical witnesses who were heard on behalf of the first-named Company were not fully cross-examined, and thus some points are left without the elucidation which a cross-examination might have brought out. Apart from this, however, the evidence, taken as a whole, is of singular interest, and will serve as a guide in all similar cases. Many "sulphur battles" will, no doubt, yet be fought, and as this was, in the main, well fought, the record of it deserves preservation.

Water and Sanitary Notes.

The report of the Select Committee of the House of Commons on the Metropolitan Fire Brigade has just been issued, and, as will be seen by extracts which we give in other columns, it contains matters of great importance to the Metropolitan Water Companies. The question before the Committee was simple. They had to consider the Metropolitan Water Supply from only one point of view—its availability for the extinction of fires. We feel bound to say that there is nothing in this report to complain of. The Committee do the Water Companies full justice, especially the three who have devoted themselves to furnish a constant supply in compliance with the Act of 1871. They deal with the Metropolitan Board of Works, whose action has been simply obstructive, in a very tender manner, no doubt in deference to the Chairman of the Board, who was a member of the Committee. Still it seems to be clearly intimated that the Board have not done all they might, if they had joined heartily with the Companies in putting, as far as possible, the provisions of the Act of 1871 into force. It would, no doubt, be difficult for some of the Companies to furnish a constant supply of water under pressure, but even these might have been encouraged to do their utmost by the sanction of such regulations as were necessary for their protection. It was, however, and still is, the desire of the Board to get the supply of water into their own hands. In accordance with the recommendation of the Committee, that the water systems of the various Companies should be consolidated in the hands of some public authority, the Metropolitan Board have already under consideration a Bill to be promoted next session, to obtain power to acquire the undertakings of the London Water Companies. It is not difficult to foresee that the time will come when the water supply will inevitably fall into the hands of some public authority; but what authority? Not, we may take it, the Metropolitan Board of Works, as at present constituted. If we had a Government strong in something more than the command of a numerical majority, we should, after this report, consider the Water Companies as doomed; but, at present, we are disposed to believe that they have a long life before them. Can they do nothing among themselves to bring about the "consolidation" which is regarded as the first thing necessary towards effecting the changes requisite for the proper protection of the Metropolis? It seems to be allowed by the Committee that the supply for domestic purposes is quite adequate, and all that has to be provided for more effectually is the unremunerative supply for the extinction of fires, which, by the way, is admitted to be even now efficient. We cannot, however, shut our eyes to the fact that a crisis is impending. This Committee practically repeat the recommendation of the Royal Commission on the Metropolitan Water Supply, 1866, and say, from their own point of view:

> That the water systems now belonging to the various companies should be consolidated in the hands of a public authority, which, in dealing with the questions of constant supply, pressure, and pipeage, should be bound to have regard, not only to the convenience of consumers, but also to the requirements for the extinction of fire.

This is but one of several recommendations to which it will presently be seen the Committee advise that legislative sanction shall be given. Cannot the Water Companies, by combination, anticipate and, we might say, thwart the action of any public authority? We believe they might, with effect, and we commend the question to their earnest consideration. To do all that the Committee wish to see accomplished would require the expenditure of a considerable amount of capital for new works; but this is quite within the means of an united Company. None could do the work so well. The Metropolis, or, rather, its inhabitants, are not much in love with the authorities. They are pretty well contented with matters as they stand, and if the Water Companies will only work earnestly together in the path of progress marked out, they may safely resist the attacks which are certain to be made.

A week or two ago we made the remark that the legal, or, rather, parliamentary business of the Local Government Board was not so well conducted as it ought to be. We furnish a notable illustration of the truth of this remark to-day. The Local Board of West Houghton have been supplied with water by the Corporation of Bolton. They got it cheap—at the rate of sixpence or eightpence per 1000 gallons, we rather think; but, stimulated by the mad ambition which affects small Local Authorities, desired to have an independent supply. For this purpose they went to the Local Government Board for a Provisional Order, under the Public Health Act, 1875, which was intended to authorize them to take certain lands and waters. A local inquiry was held, of which, unfortunately, we have no report, and in the event an Order was granted, which, embodied with others in a Bill, came before the House of Lords for confirmation. What opposition was raised at the local inquiry we do not know; but in the Lords the Corporation of Bolton and some proprietors, a large number of whom are scheduled in the Order, appeared as opponents. A technical objection, raised and sustained by Mr. Michael, was at once fatal to the measure. It was shown that the Local Government Board, in making the order, exceeded their powers. The incorporation of the Lands Clauses Consolidation Act gave the West Houghton Board power to make a compulsory acquisition of land; but the saving clauses of the Public Health Act prevented them from acquiring water rights except by agreement. There was no resisting Mr. Michael's argument; the Lords at once threw out the Order, and the Local Board of West Houghton have spent their money for nothing but vexation. They have made a piteous appeal to Mr. Sclater-Booth to contribute a portion of the costs they have been involved in, consequent on the blundering of the central authority; but "the Crown can do no "wrong," and relief from that source is impossible. The moral of this story is, however, sufficiently obvious. Under the Public Health Act no compulsory powers can be acquired for the purchase of water or water rights. Thus it becomes imperative on all who wish to obtain such rights to proceed by Bill in Parliament, and not to promote a Provisional Order. There is, we perhaps ought to say, a choice. The Board of Trade can grant Orders under the Gas and Water-Works Facilities Act, and the Local Government Board can make an Order under the Public Health Act. We are strongly inclined to think the Board of Trade the safer guide; but, all things being considered, we are disposed to believe that Sanitary Authorities who desire powers to construct and maintain water-works should promote a Bill rather than seek a Provisional Order.

The Cheltenham Local Board are very desirous of acquiring the undertaking of the Water Company, but, as will be seen in another column, the latter have decided not to sell for any consideration. We admire their pluck, and would be glad to see as much displayed by all Companies whose properties are threatened with confiscation. But the times are peculiar. This session, Gas and Water Companies may be said to have triumphed in Parliament. We cannot, however, prognosticate what will happen next session. It is, however, in our opinion, incumbent on all commercial bodies to resist to the utmost the prevalent rage for confiscating their undertakings.

We are likely to obtain an accurate view of the water situation at Richmond (Surrey). The very select Vestry of that

aristocratic district are anxious, as we knew they would be, to borrow more money for the purposes of their water undertaking. The Local Government Board, however, refuse to give permission to borrow until another local inquiry has been held. In the course of this we shall, no doubt, learn the truth, if not the whole truth, of the present condition of the water supply, as furnished by the Vestry. They at present ask for only £7000; but surely this must be utterly insufficient for their wants.

CONTRIBUTIONS TO THE THEORY OF LUMINOUS FLAMES.

By Dr. KARL HEUMANN.

[Translated from the *Journal für Gasbeleuchtung.*]

PART II.

(*Continued from p.* 12.)

Effect of Diminution or Increase of Heat on Luminous Flames.

The phenomenon already noticed of a small space between a flame and the burner, or any other cold body that touches the flame, is most conspicuous in feebly luminous flames strongly diluted with neutral gases, but it may be also quite clearly observed in ordinary luminous flames. The observation in the latter case becomes more difficult, because the eye is dazzled by the brightness of the light; but by holding a suitable screen before the flame, in such a manner as to cover the bright portion as completely as possible, this difficulty may be in a great measure overcome.

I have already alluded to the well-known fact that a flame is deprived of part of its luminosity if it is depressed or expanded by means of a cold body, and a suitably-devised experiment afforded the proof that the diminution of the light was due solely to the withdrawal of heat.

Taking this result in connexion with the appearance of a space between the flame and the body touching it, which I have already spoken of—that is, if we institute experiments on these spaces with luminous flames, at the same time noting the simultaneous alteration in the intensity of the light, we arrive at results, easy, indeed, to be foreseen, but leading to conclusions of practical interest.

If a cold metal wire is introduced into a luminous gas or candle flame, it is seen that the flame is quite extinguished in the immediate vicinity of the wire, while the luminosity is diminished through a much wider circle. Though gases are exceedingly bad conductors of heat, in this case the upward movement and great diffusibility of the gas assists the abstraction of heat by constantly bringing fresh glowing gas particles into immediate contact with the cooling wire. The effect of this abstraction of heat must, therefore, necessarily make itself felt at a distance from the wire, greater in proportion to the coldness of the wire itself; if the wire is only of small diameter, its temperature will in a comparatively short time be raised so high that the constantly diminishing abstraction of heat at last becomes too slight to produce any perceptible diminution of light.

The area of the extinguished as well as of the disilluminated gas will, therefore, with a thin metal wire, be greatest in the first moment of its introduction into the flame; the two concentric areas will diminish as the wire grows hot, and finally disappear from observation when the metal has become glowing hot.

With a thick metal rod, on the other hand, a decrease of the two areas will not take place until a certain balance is attained, and the temperature of the rod is so far raised that all the additional heat received only just suffices to replace that lost by radiation and conduction from the metal. It follows from this that a metal body of some thickness can permanently affect the luminosity of the flame touching it.

As it is generally a matter of indifference into what part of the flame the refrigerating body is introduced, the head of the burner will evidently also have a disilluminating effect, and the more or less extended dark portion of the flame close to the burner is in no small degree due to this refrigerating power of the burner.

Before I enter further upon the partial disillumination or diminution of the light of a flame by the burner, and the rush of the cold gas escaping, it seems necessary to examine more closely the manner in which disillumination may be caused by the refrigerating effect of a cold body introduced into the flame. If a luminous gas-flame, for instance, is slightly depressed by a porcelain saucer, the flame loses some of its light, and the porcelain becomes covered with a thick layer of soot. But if the refrigerating object is at once quickly immersed as far as the lower half of the flame, the light disappears entirely, and the porcelain is not sooted in the least.

I have shown before that the extension of the flame and its consequences are immaterial to the case in question, and that the disillumination must be attributed to abstraction of heat by the cold body. If, therefore, in each case, an equal surface of the porcelain plate is allowed to be in contact with the flame, which may easily be arranged, the refrigerating effect will be pretty nearly equal,* and yet the plate becomes covered with soot if it is in the upper part of the flame, but not if it is in the lower portion. To ascertain the cause of this difference in the flame-zones, the following experiments were made:—

A white porcelain rod introduced into the lower half of a gas-flame issuing from a round opening (8 millimètres in diameter) caused the light-envelope (*lichtmantel*), which was here only thin, to become perfectly blue to a wide extent. This was easily perceived when the eye was protected from the dazzling effect of the still luminous portion of the flame by a screen. No deposit of soot was to be seen on the rod, even after a lengthened period. Held in the upper portion of the light-envelope, the rod was immediately covered with a layer of soot, which soon became of considerable thickness. In this case also diminution of light was very clearly perceptible.

To explain these phenomena, which any one may verify, I venture the following hypothesis, which I shall endeavour to substantiate in the progress of this article:—

The carbon-containing materials forming the light may burn in two different ways—viz., luminously, that is while giving off carbon in the flame; or non-luminously, that is without this intermediate process of carbon-separation.* For the first mode of combustion, a certain high degree of heat is necessary, depending upon the nature of the combustible, while any portion of the flame which by any means is prevented from attaining that limit of temperature cannot effect this separation of carbon. Combustible gases, if diluted by a neutral gas, require a higher temperature to effect this separation than they otherwise would.

With reference to this last point, which has also been previously touched upon, chemistry offers many similar examples of diluted solutions not being decomposed, precipitation effected, &c., unless they are heated; while in concentrated solutions, the same effects are produced at a much lower temperature. The different portions of a luminous flame are of very unequal temperature, and a cold body introduced into the flame, and abstracting in each case nearly† the same amount of heat, will only cool the hot upper portion of the flame to a small extent below the temperature requisite for the separation of carbon, which process, therefore, continues undisturbed in the immediate neighbourhood. Besides this, carbon is already separated in the part of the flame below the cooling body, and the particles being carried upwards, strike against it and deposit soot—a condition which is usually present, though by suitable arrangements it may be obviated. Therefore, in the upper portion of the flame, a body introduced would become coated with soot (but, of course, only on the lower surface), even though for some distance round the cooling body the temperature were so reduced that no separation of carbon could take place. But if the cooling body is inserted into the lower, less heated portion of the luminous envelope, the temperature of the flame is reduced below the lowest degree absolutely requisite for the carbon-separation for a considerable distance round; neither illumination of that portion of the flame, nor yet a deposit of soot, can, therefore, take place, and the less so as, if the porcelain rod is properly placed, the separation of carbon lower down in the flame, as just alluded to, will not occur.

Reverting now to the experiment which induced the consideration of the action of the different portions of the flame-envelope, we find the fact of the coating of a porcelain saucer with soot, if slightly pressed on a luminous flame, explained by two circumstances, viz.:—

1. The diminution of heat is not sufficient to reduce the very hot flame-gases below the lowest temperature requisite for the separation of carbon to any distance around; and

2. The particles of carbon, separated in the lower, uncooled portions of the flame rise and attach themselves to the saucer. The non-deposit of soot, but complete disillumination of the flame, when much depressed by a cold body is, on the other hand, explained by the early cooling of the flame, preventing it from ever attaining the degree of heat necessary for the separation of carbon.

These considerations teach us that where a large deposit of soot is required (as in the preparation of lamp-black, or for the annealing of blown glass), the flame must not be too much cooled, but must contain sufficient heat to effect as complete a separation of carbon as possible. On the other hand, too high a temperature and unlimited access of air are prejudicial, as a large proportion of the carbon is then consumed. They show further that a cooling of the flame is, in fact, not necessary for the deposit of soot, because the carbon is not separated within the flame, in consequence of the diminished temperature; but, on the contrary, a high temperature is the very means by which this separation is effected. The cold body introduced into the flame rather acts as a rampart to receive the bullets discharged, and its refrigerating action only furthers the process, in so far as it prevents a greater combustion of the carbon suspended in the flame, or of that already deposited. It necessarily follows that a deposit of soot will take place even on a glowing surface immersed in the luminous flame.

In a flame burning without smoke, all the carbon separated is consumed, partly in the interior of the flame, partly in its outer envelope, but this combustion will be less perfect where the flame is bounded, not by the air, but by the solid body in contact with it. Nevertheless, even here the access of air is not completely prevented, and, therefore, a portion of the deposited, but still glowing, soot, will continually be burned. The deposit of soot on a glowing surface is, therefore, not quite so large as in one less heated; but, with a *very* cold body, it may occur that the soot deposit, under certain circumstances, becomes much smaller, or even will not take place at all.

In experimenting to prove that a glowing-hot object will have soot deposited upon it by a luminous gas-flame, care must be taken not to expose the surface to the air while at such a high temperature, otherwise all the soot will, in an extremely short space of time, sometimes even instantaneously, be consumed and disappear. The best plan is to heat a platinum saucer vertically suspended, by means of a Bunsen lamp fastened horizontally, and directed against the concave, and when glowing hot to direct a gas-flame, issuing from a tube, against the convex side. The disappearance of the brightness of the surface will of itself show a deposit of soot.

* The upper and more intensely heated portion of the flame will part with rather more heat, in a given time, to the porcelain plate than the lower portion, on account of the greater difference in temperature.

* I decidedly hold to the view already expressed as to the luminosity of such flames being occasioned by the separation of solid carbon; and in a future essay I shall bring fresh proof of the correctness of this view.

† See last note but one.

If the gas-flame is moved aside slightly, the soot, now exposed to the air, will immediately burn with a bright heat.

But by waiting until the layer of soot has attained some thickness, and then simultaneously removing both the light and the heat flame, though a portion of the soot will still be burned, the platinum cools so quickly that a considerable portion of the soot will remain unconsumed.

A striking proof that the cooling of the flame is only a subsidiary cause of the deposit of soot, and that the cooling body only acts as a rampart to receive the rapidly moving carbon particles, is the fact that a porcelain rod introduced into the flame is coated almost exclusively on its lower surface, or that exposed to the issuing gas-jet, the upper surface only becoming slightly blackened, and that, after a considerable lapse of time.

This fact is a fresh and important proof that the soot exists in the flame as a solid body, and not, as Frankland supposed, in the form of vapour; otherwise the deposit would be a consequence of refrigeration, and condensation of the dense light-yielding hydrocarbon vapours would also take place on the upper surface of the body introduced into the flame.

(To be continued.)

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CXL.

Subways (*concluded*).

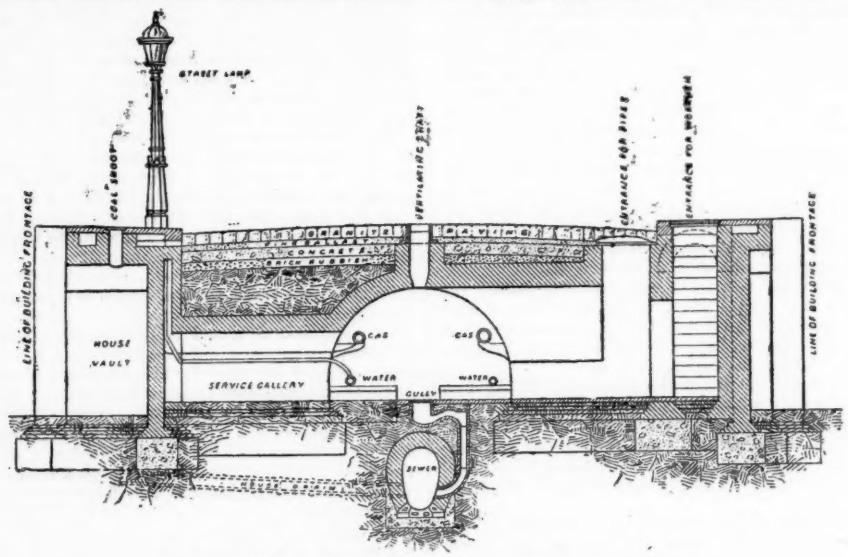
The provisions made for laying pipes in the subways of the Viaduct are as follows:—On each side next to the house vaults, cast-iron chairs are let into the stone floor; above the chairs are two rows of cast-iron brackets projecting from the wall, the first row being 4 feet 3 inches, and the second 7 feet 6 inches above the floor of the subway; the chairs carry water-pipes, the brackets gas-pipes. On the opposite side are brackets for telegraph pipes and wires. The upper surface of the chairs and brackets are cast with such curvatures as will fit pipes of considerable diameter, and provision is made to adapt the brackets to pipes of smaller diameter, by moveable wedges, cast with such curvatures as may be needed at the time. These wedges are screwed on to the brackets, and can be removed to give place to others, if pipes of different diameters are substituted. All the chairs and brackets are so arranged as to afford ample space around each of the pipes for workmen to get to every part of them.

In the shafts at Farringdon Street and Shoe Lane, where the pipes descend vertically to a lower level, brackets are let into the wall, of such form as to fit the diameter of the pipes, and when the latter are placed in position against them, iron bands, also specially designed to fit the pipes, are passed round so as to secure them to the brackets; the ends of the fixed brackets and the moveable bands are then screwed together.

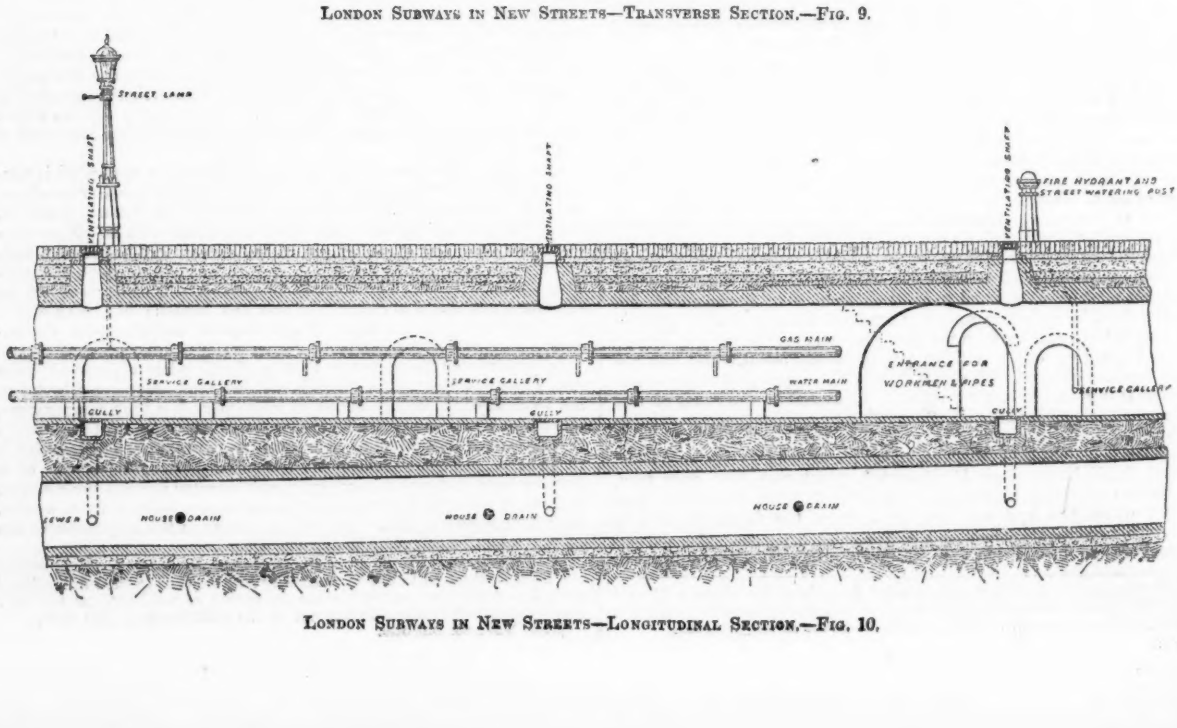
At the eastern end of the Viaduct, where the subways are 7 feet wide, and 11 feet 6 inches high, the gas and water-pipes descend into them from beneath the surface of the adjacent ground by bends; the water-pipes are then laid on the cast-iron chairs, and the gas-pipes on the brackets, and are thence carried in parallel lines, crossing over the London, Chatham, and Dover Railway in Farringdon Street; they then descend by the vertical shafts, and again curving upwards, join the mains which are placed in the street soil of that thoroughfare.

On the western side of Farringdon Street the pipes rise in a similar manner, and are carried on the chairs and brackets to Shoe Lane, where they descend by shafts, go under that thoroughfare in the subways, again rise, and are carried thence to the Viaduct Circus, where the form of the subway changes, and the pipes both for gas and water are brought by curved junctions to the level of the brick and stone piers, and are carried upon them in three parallel lines to the end of the subways, where they curve upwards and leave the subways, joining on to the pipes laid in the ordinary manner beneath the surface of the roadway of Holborn.

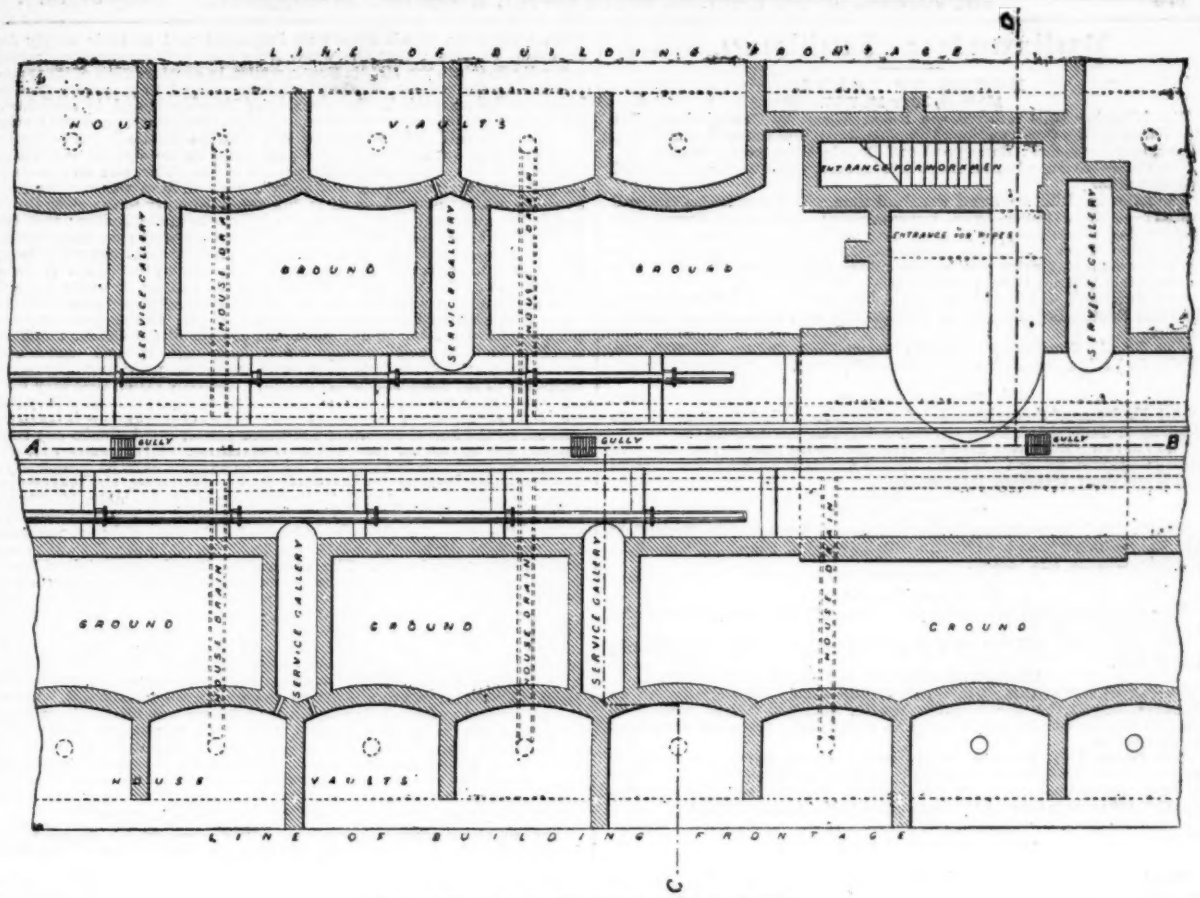
The water-mains are provided, where required, with stopcocks, air-valves, emptying-cocks which discharge into the sewers, and cocks for washing out the subways; branch pipes also rise from the mains, and are carried through the roof of the subway, to the street surface, for supplying hydrants on the Viaduct level for street-watering.



London Subways in New Streets—Transverse Section.—Fig. 9.



London Subways in New Streets—Longitudinal Section.—Fig. 10.



London Subways in New Streets—Plan.—Fig. 11.

Fire hydrants are also provided for in a similar manner, and are placed along the Viaduct at intervals of about 130 feet.

The hydrants on the Viaduct are placed at such distances apart as to enable the surface to be washed by jet and hose, and are so designed that, when the pipes are shut off from the mains, an emptying-valve is opened, which allows them to become empty and dry, and by this means there is no difficulty, in times of severe frost, in obtaining water for fires. The supply in these mains has been constant since the water was turned on.

The gas-mains are fitted with stopcocks and syphons, which are perfectly accessible. The service-pipes for the street-lamps rise vertically from the mains, and pass through openings in the arches into the lamp-posts, which are placed immediately above.

The service-pipes, both for gas and water, are laid on to each house, each main being tapped, and a junction, with stopcock, provided.

A service-pipe, connected with the gas-main, is carried along the side of the subway, and at intervals are burners, so that the subway can be wholly or partially illuminated, as occasion requires. Meters fixed in the subways register the quantity of gas consumed.

In the northern subway of the Viaduct, two lines of 3-inch telegraph-pipe are placed upon the brackets provided for them; these pipes descend at Farringdon Street, and are carried beneath that thoroughfare, and through the subways west of Farringdon Street, in a similar manner to the gas and water pipes, until they reach the subway beneath the Viaduct Circus, where they are carried by slings suspended from the crown.

On the south side of the Viaduct there is one line of 3-inch telegraph-pipes which is carried along the subway east of Farringdon Street, upon the brackets, in a similar manner to those on the northern side; but instead of descending the shaft at Farringdon Street, it is taken through the abutment and slung underneath the bridge; it is carried through the subway below Farringdon Street and Shoe Lane, across Shoe Lane, suspended by slings to the under side of the bridge, and west of Shoe Lane bridge is carried in a similar manner to those on the northern side to the western end of the subway. The telegraph-pipes are all fitted with lidded bends and joint boxes, and in all cases are readily accessible.

The subways in Charterhouse Street, Snow Hill, St. Andrew's Street, Shoe Lane, and St. Bride Street, are constructed underneath the centre of the roadway, and complete lines of gas and water pipes are laid upon each side. The services are therefore taken from the mains on the side which is nearest to the houses, and the central passage way throughout the subway is left perfectly unimpeded.

In all the street subways, as well as those in the Viaduct, there are stopcocks and emptying-cocks to the water-mains, and hydrant junctions for street-watering and for fire; and on the gas-mains are syphons and stopcocks. The supply-pipes to the gas-lamps vary slightly in detail, but in principle resemble those described for the Viaduct, and all are lighted in a similar manner by lines of service-pipes which pass along the crown of the subways, and to which pendent burners are attached.

The pipes in the subways of the Viaduct were, under the terms of the Act of Parliament, laid at the expense of the Corporation, these being in lieu of those removed from the main lines of thoroughfare; but for the new streets, the pipes required were at the expense of the respective companies.

The subways in the Viaduct have now had pipes in them charged with gas and water for five years, and the other streets for nearly a like period; they have been on several occasions lighted up with gas, and exhibited to the public, workmen have executed repairs, and performed the ordinary work in them; no special precautions have been found necessary as regards the use of lights or fires, no explosions have taken place, nor has such contraction or expansion of pipes resulted from the variations of temperature as materially affect either the gas or water supply. Various alterations have also been made in the gas, water, and telegraph pipes since the subways were completed, and it has not been necessary to open the pavements for these purposes, so that the system may be said to be successful.

Cheltenham Water-Works Company.—At a meeting of the Cheltenham Town Council on the 23rd inst., it was reported by the Special Water Supply Committee that they had received a letter from the clerk to the water company, accompanied by the following minute of proceedings of the Committee of Management of that company of their meeting on May 26: —"It was resolved that the town council be referred to the resolution passed by this committee, and forwarded to the late Cheltenham Improvement Commissioners in May, 1870, and be informed that the company do not contemplate parting with their undertaking, and therefore respectfully decline to enter into negotiations with the corporation for the sale of their works to the town, and that the town council be at the same time informed that the company are perfectly able and willing to afford a supply of water to such of the poorer districts of the borough as may require the same." The Water Supply Committee asked for power, under the circumstances, to obtain such professional and other assistance as they might require, to enable them to form an opinion as to the further steps to be taken in the matter, which, after some conversation as to the probable cost of the proceedings, was agreed to.

Damage to Gas-Mains by Landslip at Bath.—The extensive landslip which made itself apparent more than a year ago on the northern slope of the city of Bath is becoming more serious. A number of houses are dangerously affected by the subsidence, and the city surveyor has served a fresh batch of notices on owners, directing their attention to the unsafe condition of their tenements. Walcot church has lately exhibited signs of a settlement, and 300 yards above, a very high and stout wall, erected by the corporation as a support, has cracked. The town council have called in professional advice, and the continued slipping of the hill side over a considerable area, mainly covered with cottages occupied by artisans, is attributed to a current of water, descending the hill to the river, acting upon a substratum of sand and gravel. About two years ago a gas explosion, which caused great damage to property, and occasioned loss of life, occurred in the district, from the dislocation of pipes. The gas company were sued and paid heavy damages for what a jury regarded as bad workmanship, but it is now considered in many quarters that the slipping of the earth, which has since fractured scores of strongly-built walls, was the cause of the gas-pipes breaking. The gas company have now cut off the gas.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 23, 1877.

The following Bills received the Royal Assent by Commission:—Gas and Water Orders Confirmation (Abingdon, &c.); Blackburn Borough Gas, Water, and Extension; Ramsgate Local Board; West Surrey Water.

The Commons amendments to the Londonderry Gas Bill were considered and agreed to.

The following Bills were read the third time, with the amendments, and passed:—Ashton-under-Lyne Improvement; Bridgwater Corporation Water; Carshalton Gas; Colne Gas; Croydon Commercial Gas; Glasgow Corporation Water; Leeds Improvement; Louth Gas; Newcastle-under-Lyme Borough Extension and Improvement; Perth Water; Stretford Gas; Sunningdale District Water; Thanet Gas; Waterford Gas.

The Burslem Local Board, the Bolton Improvement, and the Dukinfield and Denton Local Boards of Health Bills were reported with amendments.

The Local Government Board's Provisional Orders Confirmation (Hyde, &c.) Bill was read the third time and passed.

TUESDAY, JULY 24.

The Chairman of Committees informed the House that the opposition to the United General Gas Company (Limerick) Bill was withdrawn.

The following Bills were read the third time, with the amendments, and passed:—Ashton-under-Lyne Gas; Bishop Auckland District Gas; Epsom and Ewell Gas; Wakefield Improvement.

THURSDAY, JULY 26.

The Bolton Improvement, the Burslem Local Board, and the Dukinfield and Denton Local Boards of Health Bills were read the third time, with the amendments, and passed.

FRIDAY, JULY 27.

The United General Gas Company (Limerick) Bill was reported with amendments.

The Kent Water Bill was read the third time, with the amendments, and passed.

AUCTION CLAUSES IN GAS BILLS.

The CHAIRMAN of COMMITTEES (Earl Redesdale) gave notice that, on Tuesday, July 31, he would move that the Standing Orders relating to Private Bills be considered, in order to their being amended as follows (*inter alia*):—

New Order, 140A. *In every Bill by which an existing gas company is authorized to raise additional capital, provision shall be made for the offer of such capital in shares or stock to be paid up within a limited period by public auction or tender at the best price which can be obtained.*

HOUSE OF COMMONS.

MONDAY, JULY 23, 1877.

The Lords amendments to the Coatbridge Gas, the Wakefield Gas, and the Woolwich, Plumstead, and Charlton Consumers Gas Bills were agreed to.

TUESDAY, JULY 24.

The Local Government Board's Provisional Orders Confirmation (Hyde, &c.) Bill (Lords) was read the first time, and referred to the Examiners.

The Lords amendments to the Reservoirs Bill were agreed to.

Dr. CAMERON gave notice that on Monday, July 30, he would ask the Secretary of State for the Home Department whether, since the publication of the sixth Report of the Royal Commission on Rivers Pollution "On the Domestic Water Supply of Great Britain," any official reports on the purification of impure water for domestic use have been obtained by the War Office, the India Office, or other public department; and, if so, whether there is any objection to lay such reports upon the table of the House.

WEDNESDAY, JULY 25.

The Lords amendments to the following Bills were agreed to:—Carnforth District Water; Christchurch Gas; Heywood Water; North Cheshire Water; Southend Gas.

The Lords amendments to the Commons amendments to the East Worcestershire Water and the Lowestoft Water, Gas, and Market Bills (Lords) were agreed to.

The Examiners reported that the Standing Order applicable to the Local Government Board's Provisional Orders Confirmation (Hyde, &c.) Bill (Lords) has been complied with.

THURSDAY, JULY 26.

The Lords amendments to the Leicester Gas Bill were agreed to.

The Local Goverment Board's Provisional Orders Confirmation (Hyde, &c.) Bill (Lords) was read a second time and committed.

FRIDAY, JULY 27.

The Lords amendments to the following Bills were agreed to:—Ashton-under-Lyne Improvement; Bridgwater Corporation Water; Carshalton Gas; Colne Gas; Croydon Commercial Gas; Glasgow Corporation Water; Leeds Improvement; Newcastle-under-Lyme Borough Extension and Improvement; Perth Water; Stretford Gas; Sunningdale District Water; Thanet Gas; Waterford Gas.

HOUSE OF LORDS COMMITTEE.

TUESDAY, JULY 17.

(*Before Earl* COWPER, *Chairman; Viscount* POWERSCOURT, *Lord* RAGLAN, *Lord* HATHERTON, *and Lord* SEATON.)

LOCAL GOVERNMENT BOARD'S PROVISIONAL ORDERS CONFIRMATION BILL—WEST HOUGHTON ORDER.

Mr. LITTLER, Q.C., Mr. SALISBURY, and Mr. EDGE appeared for the promoters; Mr. MILLWARD, Q.C., for the Earl of Bradford; Mr. MICHAEL for the Corporation of Bolton; Mr. GRANVILLE SOMERSET, Q.C., for the Bridgewater Trustees; and Mr. PEMBER, Q.C., Mr. FITZGERALD, Mr. SHIRESS WILL, Mr. PEMBROKE STEPHENS, and Mr. BALFOUR BROWNE, Q.C., on behalf of other proprietors whose water rights were affected by the provisions of the Order.

The Corporation of Bolton, in their petition, pointed out that the scheme of the local board, so far as the corporation were concerned, was to construct a large reservoir in the township of Horwich, and, by means of certain catchwater drains, to collect and lead into that reservoir, and impound there, the waters from a gathering-ground in the neighbouring township of Heaton, and also from certain streams which flow into the Middle Brook, thence into the river Croal, and so into the rivers Tonge and Irwell—the purpose being to divert the whole of these waters into the district of the local board, which has a different drainage outlet. The corporation alleged that they are possessed of a very extensive and costly system of water-works, whereby they supply the borough of Bolton and various adjacent places with water; that the gathering-ground at Heaton forms part of their own gathering-ground, whereby they supply their Heaton reservoir, which affords an important part of their supply for domestic purposes; that the water from that gathering-ground would naturally flow into the Middle Brook, whilst, in consideration of its appropriation by the petitioners, they had been obliged to construct a large compensation reservoir in the township of Rumworth, and to send down the brook, from that reservoir, a large supply of compensation water for the benefit of the mill and riparian owners; that the Middle Brook is almost entirely dependent for its supply of pure water on the streams and waters proposed to be diverted under the powers of the Order, and on this compensation water sent down, as already described, from the corporation's reservoir, while the brook itself is the chief tributary to the river Croal, which flows through the very heart of the borough of Bolton; that the Middle Brook and the river Croal have numerous works on their banks, and are liable to pollution and obstruction from various causes, it being therefore of the utmost importance to the sanitary condition of these streams and of the borough of Bolton that the volume of water therein, especially the pure water, should not be decreased, so that the scour of the river, sluggish already, should not be diminished. The corporation complained that the local board, under the powers of the Order, would be enabled to take, and wholly divert from the natural watershed, the whole of the waters they seek, without providing any compensation to the streams affected thereby; and they stated that they were advised that in the event of the Order being confirmed, neither they (the corporation) nor any of the millowners or riparian proprietors injuriously affected by the loss of the water and water power, could obtain any compensation in money for the injury so sustained, whilst in any case the amount of compensation required would be so great as to be practically a bar to the execution of the proposed works. Moreover, the corporation stated they were advised that, by the provisions of the Public Health Act of 1875, no waters or water rights could be acquired by any local authority without the consent of the persons interested therein; whereas, nevertheless, the Order professed to enable the local board to acquire waters and water rights compulsorily. The corporation therefore maintained that it was beyond the powers of the Local Government Board to make such an Order. The corporation further alleged that the proposed works were needless, as they themselves had power under their local Acts, and were able and willing to supply the local board with any quantity of water they needed in bulk, and at a less cost than they could otherwise procure, while, in fact, the heads of an agreement had been submitted by the local board to the corporation, and approved of by them, and an agreement in conformity therewith was now awaiting the seal of the local board, whereby the petitioners undertook in perpetuity to deliver water to the local board in bulk at the price therein mentioned. The corporation made other allegations, to the effect that the proposed works were defective in various engineering details, interfering needlessly and injuriously with roads and other public and private property; that the proposed reservoir would be ill-situated, and its construction dangerous; and that the works would interfere injuriously with certain of the corporation's gas-mains.

The other petitioners objected to the Order chiefly on the ground of the interference with their water rights which the confirmation of the Order in question would involve.

Mr. MICHAEL, as counsel for the Corporation of Bolton, wished, before the committee proceeded with the consideration of the case on its merits, to take a preliminary objection. He referred to that portion of the petition which questioned the power of the Local Government Board to make the Order without the persons interested having given their consent, and quoted from sections of the Public Health Act, 1875, bearing upon that subject to show that, as he maintained, the objection was well founded. Under the terms of the statute, the Legislature had provided means of arbitration in the event of persons who were interested feeling aggrieved, or feeling that their interests were injuriously affected by the proposed works; and there was no power by which water rights could be compulsorily taken away under such circumstances. The course which the law prescribed in that respect had not been followed, and, therefore, the Provisional Order was illegal, and could not be affirmed.

Mr. MILLWARD, for the Earl of Bradford, took the same preliminary objection, pointing out that there was a distinction which, in this case, had not been observed as to the powers for taking lands, and powers for taking water rights.

The COMMITTEE, having conferred with Lord Redesdale, as Chairman of Committees, decided further to hear counsel.

Mr. GRANVILLE SOMERSET followed on the same side, strongly supporting the objections, and trusting that their lordships would concede the points urged. The opponents were, he said, entirely without remedy if this Bill passed into law. If the water was to be obtained, let it be got by the usual course of procedure. He argued that water might also include the buying up of water-mills, dams, and weirs, and this would be injurious. The Act of 1875 meant by "land" simply dry land, and not water.

Mr. PEMBER, on behalf of Mr. C. J. Stonor, of Anderton Hall, near Chorley, Lancashire, Mr. Fleming, and Sir Charles Frederick Smythe, Bart., argued against the confirmation of the Order authorizing the projected works. It was, he said, a very important Bill indeed to the inhabitants of the neighbourhood, and the question arising was whether the promoters having power, under the Provisional Order, to take land, had power also to acquire streams and brooks compulsorily. The quantity of land spoken of in clause 76 was naturally land, and not water rights. One could not claim a right to a quantity of water which flowed on through a place. A person could have a right to particular land, but not a right to particular water. If the promoters could not buy water-mills, dams, and weirs, they could not, he contended, acquire the water of the rivers which fed them. If they did do so, they would practically acquire the mills, dams, and weirs, as the supply of water would be cut off, and render them useless to their owners. The Local Government Board had, he contended, exceeded their powers, and their lordships could not entertain the Bill; and he asked them not to proceed any further with it so far as it concerned the Provisional Order affecting West Houghton.

Mr. SHIRESS WILL also argued against the confirmation of the Order.

Mr. LITTLER, on behalf of the promoters, replied to the arguments advanced against the confirmation of the Provisional Order, characterizing them all as a curious medley, contradictory and absurd, and as showing the difficulty a number of objectors had in twisting their yarns together to make a sound rope. There was not, he said, one thing in the whole of the arguments worthy of consideration. The objectors went on the principle that the promoters were not going to compensate them, but that was not so. If it were so, their lordships attention might with justice be called to the fact, and they would, no doubt, take some notice of it. But compensation would be given. It was not right and fair that they should come there and try to upset the Bill on a preliminary point, without their lordships having had an opportunity of considering the facts of the case. If the case were studied, it would be seen that the opponents of the Provisional Order would receive no injury, and their lordships, too, would see that the Secretary of State said he could not exercise any judicial functions in the matter, but his decision was only like a report. It was for their lordships to decide the matter when they had heard the case on its merits, and they could not decide a question on its merits until they had heard the facts. The matter came before their lordships exactly the same as

did any private Bill, and when they had heard the evidence they would give their decision. There was an inquiry on the spot, not last year, but last year twelve months, on the very subject, and not a single objection was raised to the scheme then; and, although the promoters promised to prevent any injury to the streams, the opponents came there to oppose them. After alluding to the compulsory land clauses, which it was proposed to put in force by the Order, the learned counsel argued that they would not affect the opponents. In fact, the promoters did not intend in any way to do anything that would be likely to injure them, and tend to work injuriously against them. Why, he said, should the right to take water be excluded when they had a right to take the land? They might take, for instance, one of the finest estates in England under a Provisional Order of the Local Government Board—say Chatsworth—and say they must not take the tributaries in it of the Wye in Derbyshire. The argument was perfectly absurd, and he believed their lordships would not attempt to put such restrictions on an Act of Parliament as that. It was perfectly absurd to suppose that in taking land they were not entitled also to the water supplying it. But the promoters were not going to acquire the whole of the streams, but only a part of them, for the purpose of the water-works. In fact, he might say they were not going to take water anywhere.

Mr. Granville Somerset: Oh, yes, you are; you are going to take a great deal from the Bridgewater estates.

Mr. Littler: We are interfering with no springs, and taking no springs from any man's land; and the only sense in which we are taking water is, that we take some from the streams, which, if we did not take it, would only drop down the streams and flow away.

Mr. Pember objected, on the part of his clients, that springs would be taken possession of.

Mr. Littler said that he did not intend to interfere with Mr. Charles Joseph Stonor's rights, nor the rights of the others. He then went on to refer to the terms of their petition, and spoke especially on the fishing rights, with which he said the Order did not propose to interfere, and also stated that the only taking of water which the promoters intended was easements, which they would let out without disturbing proprietary rights. He protested that they were not the promoters of a private Bill, and that the course was not their own. It was an action of the Local Government Board, and he hoped they would not be compelled to throw away the whole of the costs they had incurred, and go to the great expense of coming again. If their lordships found, and he had no doubt they would find, that no injury would be done to any one by the course of procedure they were adopting, he hoped they would not put the promoters to the enormous inconvenience of sending them back another year for a water supply. He asked their lordships not to be hard on them by going on a dry question of law, but to strain a point, if it were necessary to strain one, and hear the facts of the case on its merits, and look at the matter on its broad principles. After referring to the number of persons (600) upon whom notices had been served, and from whom no protest had been received, he concluded by asking that the Order might be proceeded with.

Mr. Michael said the 600 persons upon whom notices had been served were persons whose land would not be interfered with by the Order.

The room was then cleared, and, on the readmission of the parties,

The Chairman said the committee had decided that the preliminary objection was good, and that the Order was invalid. The Order would not therefore be considered.

The committee then adjourned.

HOUSE OF COMMONS COMMITTEE.

Thursday, April 26.

(*Before Mr.* Sandford, *Chairman*; *Mr.* Lambert, *Mr.* Hanbury, *Sir* Hugh Cholmeley, *and Mr.* A. Bonham-Carter, *Referee.*)

HANLEY CORPORATION GAS BILL.

Mr. Cripps, Q.C., Mr. Richards, Q.C., and Mr. Moulton appeared for the promoters; and Mr. Pope, Q.C., Mr. Michael, and Mr. Jeune for the British Gaslight Company, opponents of the Bill. Mr. Barber appeared on behalf of the Tunstall Local Board, in support of the Bill but in opposition to certain clauses, with a view to enable that Board to become possessed of so much of the British Gaslight Company's undertaking as was situated in the Tunstall district.

Mr. Richards, in opening the case for the promoters, said the object of the Bill was the transfer to the Corporation of Hanley—which was the most important town in the Potteries—of the British Gaslight Company's undertaking, so far as related to the company's property in the Potteries district. The preamble of the Bill, after a recital of the constitution of the company, set forth that the manufacture and supply of gas within the borough of Hanley and the neighbourhood could be conducted with greater efficiency and economy by the corporation than by the company, and it was, therefore, expedient that the undertaking should be transferred to the corporation accordingly. Up to the year 1858, the amount of money expended by the company on capital account was £42,610, upon which 10 per cent. was allowed, and they had since expended £14,946 11s. 6d., which was limited to 7½ per cent. The preamble also recited that the propriety of the promotion of the Bill was confirmed by an absolute majority of the whole number of the council—viz., 24 out of 25 present; and then it went on to state what the petitioners required. The population of Hanley was upwards of 45,000, occupying an area of 17,500 acres, and with property of the rateable value of about £140,000 a year. The town was incorporated in 1857, prior to which time the local governing authority was a body of commissioners, who entered into a contract to light the streets and public places with gas, oil, or otherwise, under such terms as they might consider expedient; and also to provide and set up, or authorize a company to provide and set up, such works as might be considered necessary. By section 74 of the Act of 1857, all the powers of the old commissioners were transferred to the corporation, who accepted them, with the reservation of all previously existing rights. About 1824 the British Gaslight Company were formed, and by their deed were enabled to supply gas to various towns. Under incorporation powers, obtained in 1856 and 1857, they supplied gas to numerous towns, including Hull, Trowbridge, Norwich, &c., and Hanley and other towns in the Potteries. The works at Hanley were established in 1826, to supply gas to Hanley, Shelton, Stoke, Fenton, Lane Delf, Lane End, Burslem, Tunstall, Norton-in-the-Moors, and Smallthorn. What were originally known as Lane Delf and Lane End had since become incorporated, and formed the Municipality of Longton. The British Gaslight Company, therefore, had a monopoly of the supply of gas to the Potteries district for a great number of years. In 1858 they sold the portion of their works relating to Stoke, Fenton, and Longton, and so got rid of that part of their concern. Stoke continued the supply of gas until 1860, when they sold to Longton the Longton section of the works; and the Longton Company had only this session of Parliament transferred, by sale, their interest in the works to the Town Council of Longton. The Stoke Company, however, were still existing, and had been conducted with very considerable success; but negotiations were now going on for a transfer of the Stoke Gas-Works to the corporation of that borough, both parties, as was understood, agreeing to such arrangement. The British Gas Company had also sold their rights at Burslem, and the Local Board of Burslem were, in the present session of Parliament, entering into a contract to purchase the works which had been previously sold by the British Gaslight Company. Those sales and transfers having taken place, nothing now remained of the company's works but Hanley, Tunstall, and Smallthorn. The way in which the British Gas Company supplied the borough of Hanley gave very general dissatisfaction; but it would not be necessary to weary the committee by going through the letters which had been written on the subject, and the deputations which had been appointed to try and obtain a more satisfactory state of things, as all that would be detailed in evidence. In 1865 the discontent culminated in the form of a proposed Hanley Gas Consumers Company. The Corporation of Hanley supported that proposal, but did nothing beyond petitioning in favour of it. A compromise was, however, effected over that Bill, the British Gas Company agreeing to pay the costs incurred by the opposition company—a sum of £6000—and that satisfied the promoters. The British Gaslight Company also made some concession to the consumers, the price of gas being limited to 3s. 6d. per 1000 feet, and the illuminating power to be equal to 14 candles, which were better terms than they had previously. But while the threatened opposition was thus settled, the gas company were saddled with an extra £6000. It would be shown by evidence that a long series of complaints had been made, and dissatisfaction with the company long felt and expressed; and it was only a reasonable deduction that persons connected with gas-works, who were not locally interested in the prosperity of the place where they supplied gas, were not so likely to satisfactorily manage the business as those immediately affected by residence and local associations. It was a fact that if the authorities of Hanley wanted to confer with the directors of the gas company, they could not get what they wanted, and a long time often elapsed before communications were made by the company's directors, though there was resident at Hanley a local official. The British Gas Company seemed to be quite the opposite of a consumers gas company, and many disadvantages resulted from having gentlemen connected with the gas-works who had only a very slight acquaintance with the place. From 1866 to 1875 constant complaints were made against the company, and meetings were held in reference thereto, which were perfectly spontaneous in character, and not in any way got up under the influence of the corporation, nor even attended by members of the corporation. A petition had been presented in favour of the Bill, which was very largely signed. On behalf of the company it was stated that the business had not been profitable. They were entitled to set aside a reserve-fund when the profits reached a certain point, and after that would come a reduction in the price of gas; but in going through their accounts it was found that the company had never paid their maximum dividend, £10,700 being now the arrears, and the promoters of the Bill were a little astonished at that representation, from the fact that in the adjoining towns the gas-works were a very great success, and paid the full dividend allowed by Parliament. Whether it was because the company had not conducted their business so well and skilfully as in the case of the adjoining towns, he could not say. Notwithstanding, however, that the company had not paid their full dividend, the Corporation of Hanley were prepared, under the terms of the present Bill, to make a very liberal offer. They proposed to take the gas-works into their own hands, and grant annuities to the shareholders equal to the full parliamentary dividend they were entitled to receive upon their present capital. That seemed to be an extremely liberal offer; in fact, the company, in their petition against the Bill, said it was too liberal—it was so liberal that it would result in injustice to the ratepayers of Hanley. The corporation were also very much struck with the fact that at Hanley 3s. 6d. per 1000 feet was charged, while at Hull the charge was only 2s. 6d. Could it be that the profits from the Hanley works were in any way applied to the deficiencies at Hull? The expended capital on the undertaking was said to be £42,000; and it was stated in the preamble to the Bill that a certain portion of the money was allocated to Hanley. It might be said that the population of Hull was very much larger than Hanley; but against that it could be argued that the company had opposition at Hull, but not at Hanley. The corporation also proposed to take the whole of the district remaining of that which the company originally supplied with gas, and which included Tunstall and Smallthorn. They had not the slightest desire to supply gas beyond their own boundaries, and it was arranged that Tunstall should take to themselves power to supply their own district. Another thing was, that it was thought desirable to reduce the expenses of management, because the cost to the company now was just about the same as when the entire district was supplied by them, and that cost being thrown upon a diminished area, fell heavier upon those consuming gas in that contracted area. When it was seen that their neighbours at Stoke and Longton were carrying on a profitable business with their gas-works, while the British Gas Company were carrying on theirs at a loss, with certain arrears of dividend, the promoters of the Bill thought there was some reason for it; and they desired the gas-works, believing that they could carry them on more satisfactorily. Precedents could be found for the committee sanctioning this Bill. For some time a strong feeling seemed to be entertained against the transference of gas-works and water-works from private companies to corporations; and it was only of late years that the advisability of such transfers being sanctioned had been entertained. Every case ought to stand upon its own merits; and, no doubt, a great deal would depend upon the terms upon which it was proposed to hand over an undertaking. There was the case of Middlesbrough last year; the Birmingham case, in which peculiar circumstances arose for discussion and decision; the Rotherham case, and the Glasgow case, all similar in character, the Rotherham case being one of distinct compulsory purchase. He (Mr. Richards) thought the dissatisfaction of the consumers would be found to be well grounded. No sort of injustice would be done to the company, who had been offered a handsome price; and, as this was purely a question of commercial interest, he thought there were strong grounds for the committee sanctioning the Bill. The only petition against the Bill was from the British Gaslight Company themselves.

The Chairman inquired if there was no other opposition.

Mr. Richards said that there was not. His friend, Mr. Barber, only appeared for Tunstall in relation to the clauses affecting them in the way he had indicated.

Mr. Barber stated that the clauses respecting which he appeared would be agreed to.

Mr. Richards said with regard to the objections to the Bill raised by the British Gaslight Company in their petition, he found that in clause 10 they stated as follows:—"Your petitioners wholly object to the proposed transfer of their said undertaking to the corporation upon any terms whatever, and particularly upon the terms sought to be authorized by the Bill, and they submit, and are prepared to show, that the proposal contained in the Bill is unjust and injurious towards them, uncalled for on any public grounds, prejudicial to the consumers of gas in their district and still more so to the ratepayers of the borough of Hanley, and wholly inconsistent with the practice and principles which govern the decisions of Parliament." They also said that the corporation based the expediency of the transfer on the ground that there would be greater economy and efficiency in the manufacture and supply of gas if the corporation had it;

but they alleged that such results could not be attained. Of course, the answers he should give to those points were that the company had not profitably carried on the works, for although they charged the maximum price for gas, they had never made sufficient profit to divide the authorized dividend. The corporation, looking round upon their neighbours, and seeing that they all made their gas-works pay, hoped if this Bill were sanctioned to make their gas-works also pay. The petitioners stated that there would be no appreciable reduction in the working expenses if gas was supplied at the present quality and price, and they denied the expediency on public grounds of empowering the corporation to embark in the trade of manufacturers of, and dealers in, gas, and submitted that it was not to be expected such an undertaking, if carried on by means of public money, borrowed on the security of public rates, and managed by persons having no personal or pecuniary interest in its success, could be conducted with such care, efficiency, and economy as by parties whose profits were dependent upon their exertions, and who were under the control and supervision, in many important respects, of the governing body of the district. To that he would say the question was, whether it was not more likely that persons having the deepest interest in the prosperity of the place would not be more likely to conduct the gas business better than gentlemen who had no such local interest, and who did not reside in the district. The petitioners then went on to say that they had fully and faithfully acted upon and carried out all the obligations imposed upon them by the Legislature, and they had given to the gas consumers and to the public within their district all the benefits which Parliament intended to secure to them respectively, and no reasonable complaint against the conduct of the petitioners had ever been brought forward, or, if suggested, had ever been sustained. That was simply audacious, because many complaints had been made. The petitioners further said that they had on former occasions been put to great expense in defending their property and rights, and had had to surrender portions of their district, and to submit to various restrictions, and they trusted that Parliament would not allow them to be deprived of the property upon which, on the faith of the protection afforded by such concessions, the money of their shareholders had been invested, without their own consent, and with no advantage to their consumers and the public. He (Mr. Richards) had read that clause over many times, but he could not see its force. As to the surrender of their property, that had been voluntarily done, as already intimated; and the promoters of the present Bill did not wish to confiscate the company's property. By the Corporation of Hanley having the gas-works, they would be able to afford satisfaction to the gas consumers, who for a long time had been dissatisfied with the way the British Gaslight Company had supplied them. No injustice could be done to the company under the terms of the transfer, while, if it were passed over into the hands of the Hanley Corporation, it was expected it would be a good thing for the gas consumers.

FRIDAY, APRIL 27.

Mr. *John Roddy Cooke*, examined by Mr. RICHARDS.

I am Mayor of Hanley, and carry on business there as an outfitter. I have been a member of the corporation for more than nine years. During that time my attention has been frequently called to the public and private lighting in the borough, and the General Purposes Committee of the council have constantly had the matter under their consideration. They have had reason to be very much dissatisfied with the supply of gas by the British Gaslight Company. About 1865 a Consumers Gas Company were started, in consequence of the dissatisfaction felt and expressed in regard to the supply of gas in Hanley. The corporation petitioned in favour of their Bill. The gas was unsatisfactory, both as to quantity and quality. In 1874 a public analyst was appointed to examine and report as to the quality of the gas supplied, and his reports were generally of a condemnatory character. The illuminating power was generally found to be below the parliamentary standard of 14 candles, while sulphuretted hydrogen and other impurities were stated to be present to a very large extent. On the 31st of December, 1874, attention was formally called to the very bad state of the gas, and Mr. C. E. Challinor, town-clerk, by direction of the corporation, sent a letter to the gas company, in which the state of the gas was described as being almost intolerable; and threatening proceedings unless some improvement were effected. The company had a manager living in Hanley, but the secretary and the directors lived in London. On the 6th of January, 1875, a reply was received from London, in which it was stated that the matter had received the prompt attention of the directors. They, however, expressed surprise that there was cause for complaint, as they thought the supply was good, and the quality also. They further stated that measures would be taken to remedy the evil complained of, and the secretary said he would make a personal visit to Hanley. Another letter was subsequently received from the secretary, stating that the manager had reported that for three nights the gas was not of the purity it should have been, arising from the use of new purifying materials, which failed at first to arrest the impurities, but the evil had then been remedied, and the gas was of proper purity. The letter also stated that nothing should be wanting on the part of the directors to secure, to the consumers in the Potteries, gas of proper purity and of standard illuminating power. Our experience had been that the gas was very impure for seven or eight nights. A night or two following, the secretary did attend, and a meeting was held in the council chamber of the town-hall. The complaints laid before Mr. Linging were, first, the illuminating power of the gas had for three or four weeks been appreciably low; secondly, the presence of sulphuretted hydrogen during the previous two or three weeks; thirdly, the general want of gas in the neighbourhood of North Wood, and the deficiency, particularly of the supply to the public lamps; fourthly, as to the insufficient supply of gas on Saturday nights. Mr. Linging said, in reply, that, with regard to the first part of the corporation's complaints, he would show that the illuminating power they were required by the Act of Parliament to supply, namely 14 candles, had been exceeded. The records showed that the illuminating power had been on the average 15·19 candles during December. On the second point he confessed that the inhabitants of Hanley, he regretted to say, had good cause to complain. The moment he heard of the complaints, which referred particularly to three days at Christmas, he had requested Mr. Haswell to report, and he admitted impurities in the gas, in consequence of some new purifying material not acting in arresting the sulphur impurities, and, therefore, the gas had really not been what it should have been. With regard to North Wood, they found on examination that a fracture had occurred in one of the mains, and that was now being repaired. The general mains were about being revised, and, if found necessary, larger mains should be provided, both there and in the centre of the town, where complaints had been made of the deficiency in the supply on Saturday nights. As to the general supply on Saturday nights, that was a matter which could and should be immediately remedied. He assured the meeting that the company would do everything in their power to remedy the evils complained of, and would give every facility for the examination of the gas by the corporation gas analyst, and would supply any apparatus Mr. Sparkes would require. On Saturday night almost always the gas, especially in the centre of the town is required to be full on, but there has been considerable difficulty in the supply, both in the markets and shops. After that interview there was an improvement, but complaints were again manifested about April, and in consequence communications were opened in May with the company.

By the COMMITTEE: The presence of sulphuretted hydrogen was not so bad, but it was more a deficiency in supply.

Examination resumed: In consequence of continual complaints the corporation, at their meeting on the 27th of April, passed the following resolution:—"The council, recognizing the desirableness of having in their own hands the supply of gas to the inhabitants, instructs the General Purposes Committee to inquire upon what (if any) terms the British Gaslight Company, Limited, will sell to the corporation that portion of the Staffordshire Potteries works which is supplied from or dependent upon their Etruria station." In reply, the directors declined to sell the Hanley works. The gas was reported by the analyst as being very bad in 1875; of 16 observations made, 14 showed the illuminating power to be below the standard, and the town-clerk was instructed to take legal proceedings to enforce the penalties, but these proceedings failed because we had not given the necessary notice to the directors in London. It appears that by the Gas-Works Clauses Act, 1871, copies of the analyst's reports should be presented to the directors within 24 hours of their being taken, but we were not aware of that. We communicated again with the company in December, 1875, with reference to our stating that we should be compelled to take proceedings against them, to which we received the following answer:—

The directors exceedingly regret that the gas examiner should have made so unfavourable a report on the gas supplied between the 13th of October and the 15th of November last, for the readings taken by the company's officers for the month of October show an average illuminating power of 14·49 candles. By the 23rd clause of the Company's Potteries Act, 1866, the duties of the gas tester are plainly set forth, for it states that the person so appointed may at any hour between three o'clock in the afternoon and twelve o'clock at night, on producing the said order, enter on the premises of the company in the presence of the superintendent or other officers of the company or other person appointed by them, if he shall be in attendance, and if not, then in his absence, make experiments. Now, in the gas tester's report the readings recorded were in no instance taken in the presence of any of the company's officers, as the clause directs. As regards the excess of sulphur, I am not in a position to refute the gas tester's report, because in this instance, as in the case of the illuminating power of the gas, he does not give the company an opportunity of verifying its accuracy; but if the record he has made be correct, the excess of sulphur arose, as he is well aware, from an accident to some part of the machinery, and the disarrangement of other parts in consequence of extensive alterations and improvements on the works, rendered necessary by the increased demands for gas by consumers. On the completion of these additions and alterations the Sanitary Committee will have no cause for complaint as regards that portion of the resolution on pure and sufficient gas; the latter must be an unintentional charge, for the report book at the chief office of the company in Hanley has been exceptionally free from any complaints of want of sufficient gas. There is another innovation on the part of the gas tester, which he certainly should not persist in, and this is bringing his own candles, which are four to the pound, instead of using those provided by the company, which are six to the pound, as prescribed by the Act, and the accuracy of which is guaranteed. The directors assume that as they are most anxious to comply with the conditions laid on them by the Act of 1866, and to fulfil faithfully the duties imposed upon them by such Act, the Sanitary Committee are equally anxious to treat the company in no hostile spirit, but fairly and justly, and they submit that in future the officers of the company should have an opportunity of being present when the gas tester takes the readings of the illuminating power of the gas. The directors entertain the hope that the explanations given to the mayor on the 29th inst. will convince the local authorities that every care will be taken and no expense spared to give the borough of Hanley entire satisfaction.

The complaints were generally made to the local manager in the first instance, and he sometimes attended at the council chamber. Deputations from the consumers have waited upon the town council, complaining of the impurities which existed, of the deficient supply, and also of the want of illuminating power.

Mr. RICHARDS: It has been stated in the petition of the British Gas Company that the transfer to the corporation is not called for upon any public grounds, has it not?

Witness: Yes; they say it will be prejudicial to the consumers of gas in the district, and still more so to the ratepayers; but very few of the consumers think it would be prejudicial, and the deputations I have spoken of are evidence of that. The corporation are the largest consumers, paying the company nearly £2000 a year. We are willing to secure to the shareholders, annuities equal to their full maximum dividend upon their invested capital, and from their own accounts they appear never to have earned it. I believe that offer is perfectly consistent with the best interests of the ratepayers.

Mr. RICHARDS: The annuities for which you offer to take the concern off their hands would put them in a better position than they have been in hitherto, according to their own account?

Witness: They show a total deficiency of dividends amounting to £10,708. The deficiency has increased nearly £3000 since 1866. The inhabitants of Hanley regard the offer made as a very high one, but they are prepared to pay that price to reap the advantage of having the control of the gas in their own hands. The statutory town's meeting was held in December last, in the town-hall, which was crowded, when a formal resolution for promoting the present Bill was carried with only five dissentients. Before that statutory meeting there had been a meeting convened by the ratepayers themselves, without communication with the governing authorities, at which the feeling was unanimous in favour of the purchase. At the municipal elections the gas question was a leading point upon the platform. The candidates, without exception, were asked their opinion upon that question, and they all said they were in favour of the transfer, or they would have had no chance of success at the poll. The British Gas Company had formerly a very much larger district in the Potteries than they have now, but in 1858 they sold their interest in the district south of Hanley to the Stoke Company, and at the same time they sold their Burslem rights to a Burslem company. Since Stoke, Fenton, and Longton passed into the hands of the Stoke Company, the Stoke Company sold the Longton portion to a Longton company, who have entered into an agreement to hand the works over to the Longton Corporation. The Stoke Company are also concluding arrangements to hand over their works to the Stoke Corporation on the same sort of terms that we are now offering to the British Gas Company. The Burslem Company's works have been handed over to the Burslem Local Board, so there only remain Hanley, Tunstall, and a small mining place called Smallthorn, which represent the whole of the interests of the British Gas Company in the Potteries. We are willing to take the whole interest over, making a subordinate arrangement in Tunstall and Smallthorn, so that they shall take from us that which belongs to them. We do not wish to light any other part but the borough of Hanley. The Stoke Company have a large reserve-fund in hand, and they propose to reduce the price of their gas from 3s. 6d. to 3s. 3d. The price at Hanley is 3s. 6d., and judging from report the prospect of a reduction is exceedingly remote. Hanley is very much larger than any of the other towns in the neighbourhood, and I should say there is a very much greater consumption of gas there. The population of Hanley is 45,000, the area 17,500 acres, and the rateable value upwards of £140,000.

Mr. RICHARDS: Can you explain how it is that in this large and populous place, at a price of 3s. 6d., the company seem unable to pay their maximum dividend, whilst the companies round are able to pay their maximum dividends, put by a reserve-fund, and reduce the price of the gas?

Witness: No; but what we think is the reason is, that in the other towns the shareholders and directors are resident, and are interested in not

only earning a dividend, but paying the smallest price for the gas. In Hanley the shareholders, with two exceptions, are non-resident, and the directors reside in London, so that their interest is only that of earning their maximum dividend. I do not think that more than one of the directors has been in Hanley. We are in the centre of the colliery field, but the coal which the British Company use comes 5 or 6 miles. The coal used in Hull has to be conveyed 60 or 70 miles, and yet the gas is sold at 1s. per 1000 less, but there are two or three companies there. I know that the British Gas Company pay 10 per cent. dividend all round.

Mr. RICHARDS: According to the Act, is not the last capital which was allocated to Hanley limited to 7½ per cent.?

Witness: It was.

Yet you say they pay 10 per cent. all round. That is a funny thing, is it not?—Yes, it is.

I understand, according to those accounts, they do not pay the full dividend in Hanley?—They do not seem to have earned it at Hanley, but they pay it. The Norwich accounts show a greater deficiency than Hanley.

Then I suppose Trowbridge must supply it all, and that is a small place?—Yes, very small.

Mr. JEUNE (in cross-examination): I dare say Hull is a fair test of what non-local companies can do against local companies. Are you aware that at Hull the local companies charge 4s. 6d. for their gas?

Witness: I should think it very strange, although it might be so. I mentioned Hull because of the fact that the company charged us 3s. 6d. with coal on the spot, while they were supplying another town for 2s. 6d.

You have the same company, the same gentlemen, and with the same sort of principles and interests at Hull, and you have a much better result, according to you, than at Hanley, the inference you draw being that the management at Hull is very good, and the management at Hanley proportionately bad?—No. At Hull there are other companies who would supply gas, and, consequently, the British Company reduce the price, and we draw the inference that, if we had other companies at Hanley, the company would supply us at 2s. 6d.

Cross-examination continued: I have been given to understand that the residuals sell very well in the Potteries; so well that the Stoke Company have sold their residuals for more money than the original cost of the coal. If the British Gas Company only get 30 per cent., they are very bad managers. I also know that the leakage in the other parts of the Potteries district is not so great as at Hanley. I am aware that the district is undermined, and that that will cause considerable leakage, which does not exist at Hull. There are not so many mines under Stoke as under Hanley, which would make the gas more expensive to produce at the latter place. The Stoke district is much more level than Hanley, which is the second highest market town in the kingdom. I am not able to say that where there is great variety of district—partly high and partly low—it increases the cost of supplying gas. The accounts presented by the British Company are in accordance with the provisions of their own Act, but they might give fuller amounts in the form prescribed by another Act passed about the same time. The company do provide fuller accounts for the shareholders, but we have not been able to obtain them. In 1865 the British Gas Company opposed the Hanley Gas Consumers Company, and by their Act of 1866 they had to pay not only their own costs, but a portion of the costs of the consumers company. The total amount was £6000, and we were surprised to find that the consumers were saddled with the costs.

Mr. JEUNE: Are you aware that that has been paid out of revenue, and not charged to capital?

Witness: I do not know how it was paid. It stands against us in the accounts, and the consumers are expected to pay it before they get any reduction.

Cross-examination continued: I am aware that the British Gas Company charge 2 per cent. for a depreciation-fund, and that in the course of the last 19 years amounts to about £17,000.

Mr. JEUNE: The Act of 1866 provides for a depreciation-fund, which should be charged a blank amount, and as a matter of fact 2 per cent. has been charged.

Mr. MOULTON: That is an item deducted without any authority whatever.

Mr. JEUNE: Is it not the case that the company's Act of 1866 directs that a per centage shall be charged every year for depreciation?

Witness: I am not aware.

Mr. MOULTON: I do not see that there is anything in the profit and loss account to justify that.

Mr. JEUNE (to witness): You know they have charged 2 per cent., which is £1000 a year; supposing they had not charged that amount during the ten years, it would much more than have covered their maximum dividend?

Witness: Yes; and we should have had a reduction in price.

Cross-examination continued: We first contemplated buying the works in the early part of 1875 when the complaints were so general and so strong. We have, however, received complaints extending over a long series of years, so far back as before the borough was incorporated. We bore and forebore a long time before making any complaints, because people do not like to be always complaining of public bodies. Deputations often waited upon Mr. Haswell (the local manager) at the works, but the more serious complaints were sent to London. On Jan. 2, 1872, a letter was sent to the local manager respecting the unsatisfactory manner in which the lamps were lighted, and complaining of the very poor and inadequate light emitted, and also suggesting that poles should be used instead of ladders for lighting the lamps; but the complaint has not been remedied. On the 8th of October, 1872, at a council meeting the mayor referred to several complaints regarding the impurity of the gas supplied to the borough, and it was resolved that the General Purposes Committee should be requested to investigate and report as to the quality of the gas. During the interval between those two dates we had made no complaints. On Sept. 25, 1874, the attention of Mr. Haswell was again drawn to the insufficient illuminating power and bad quality of the gas, and he was requested to take steps to remove the cause of complaint. In reply, a letter was received from the secretary of the company, expressing regret at the occurrence, and stating that it was caused through an alteration and improvement in the retort-house, which was then nearly completed, and the directors felt assured there would be no ground for further complaint. Matters, however, still went on the same, and a public analyst was appointed on Dec. 8, 1874, at a salary of £25 a year. About that time Mr. Haswell was extremely ill, and he shortly afterwards died. On May 29, 1875, we made an application to know whether the company would sell the works. We gave over making complaints, and thought we would see whether we could not deal with the difficulty ourselves. The next complaint is dated Sept. 17, 1875:—

The Sanitary Committee of the Town Council have had their attention directed to the insufficient supply of gas on the nights of Friday, Saturday, and Sunday, the 10th, 11th, and 12th inst., and have requested me to say that they are much disappointed that the promised attention of the company to this subject has not been carried out on those dates. I am sure it is needless to point out the necessity, to tradesmen in the town, of a full and adequate supply at this time of the year, and as was the case on Saturday, the great inconvenience of places of business and the market property being insufficiently lighted. The committee desire me to press the subject on your attention, and hope that they may not need to have similar complaints made to them.

That letter was addressed to Mr. Linging, the new manager, and his reply was dated Sept. 29:—

In reply to your letter of the 17th inst., I am exceedingly sorry that you should have had cause to complain so soon of the bad gas supplied to you on the 10th, 11th, and 12th inst. I was making some new connexions, and lost a great deal of gas, over which I had no control; consequently, I had to cut the supply down, or I should not have had sufficient to have gone on with. I trust as soon as I get my new bench of retorts in action you will not only have better gas but a better supply. Trusting you will pardon my seeming negligence in not replying to your letter before, &c.

We then became weary of making complaints which met with no redress, and on the 17th of November the Sanitary Committee resolved that the town-clerk be instructed to take all necessary proceedings for the enforcement of the penalties; but those proceedings were discontinued, because we had not given them notice according to the General Act.

Mr. JEUNE: Do you know that there is this clause in the Act of 1866, section 23:—"If it shall be proved to the satisfaction of two justices, not being shareholders or directors of the company, or of any other company which may be then supplying or proposing to supply gas, after hearing the parties, that the illuminating power or purity of the gas does not show, when tested, equal illuminating power or purity by this Act prescribed, then the company shall forfeit such sum not exceeding £20 as the justices shall determine"? That was the power inserted in the Act of 1866, giving you authority to complain to the justices if the purity did not come up to the standard?

Witness: I cannot speak to that. I know we were advised we could not.

The complaint of November, 1875, was made by your analyst, who went upon certain days at two periods, and told you that the illuminating power was only 12·50 candles, and that there was a great deal of sulphur. Are you aware whether those tests were made in the presence of any single person belonging to the gas company?—I am not aware personally, but I should imagine from the secretary's letter that such was the case.

As to the sulphur, are you aware that upon the occasion when it was present in very large quantities the exhauster broke down?—Should the exhausters of well-managed companies break down? I was not aware that was the fact.

You think if the Corporation of Hanley managed the concern, there never would be accidents of any kind?—Not so many as have happened.

Cross-examination continued: I do not think I have mentioned all the complaints which have been made, but only the more recent ones. The effect of the Act of 1866 was to impose more stringent regulations upon the British Gas Company than had existed before. The maximum price was fixed at 3s. 6d. for 14-candle gas, and only 20 grains of sulphur allowed in 100 feet of gas. They were also bound to provide testing apparatus, which they did directly we supplied the tester. Our analyst has regularly tested the gas from 1874 to the present time, and I have seen his reports monthly.

Mr. JEUNE: There are only two occasions during the whole of that time when the gas has fallen below 14 candles—at the end of 1874 to 13·77, and in December, 1875, to 12·75—but during all the rest of the time, upon every occasion when your analyst tested, the gas was always over 14?

Mr. MOULTON: It must be a mistake in the copy.

Witness: I believe you will find from the first reports they were considerably below the parliamentary standard.

Cross-examination resumed: I was not aware that in 1858, in consequence of rival companies in the various districts, those districts were parcelled out by the parliamentary committee, and inserted in the Bill.

Mr. JEUNE: If it was the case that it was so, would it not be a very natural way in which the district should be divided?

Witness: If it was natural then, why not adopt the same course now, and let the corporation take the gas-works in Hanley, by which the consumers of the district would be benefited.

Under the present state of things, supposing more than the maximum dividend to be earned, it would be necessary to reduce the price of gas, would it not?—Here are your accounts of the deficiency against us, £10,708, which has first to be made up.

As soon as that is made up, then all the reduction goes in favour of the consumer?—Nearly every year, for the last 10 years, you have been increasing the amount. During the last year the company lost £1000, and we naturally suppose the amount of arrears has gone on increasing.

Is it not the case that you propose to charge 3s. 6d. to begin with?—Yes.

And you apply for power to take £1000 a year for general purposes out of the borough, charging 3s. 6d.?—No. The moment the gas can be reduced we should not take more than £1000 for the purposes of the borough without making the reduction.

And if you get down to 3s., after that you apply for power to take the whole of the profit for the benefit of the borough?—Subject to revision year by year; but the corporation are answerable to the ratepayers.

Some consume gas and some do not?—And those who do not consume gas will ask for it to be lowered.

The gas in Hanley will never be reduced below 3s., because the corporation would have power to take the whole profit themselves?—They ask for power to do so.

And they expect to get it?—They would think that they were justified in giving some to the consumer and some to the ratepayer.

That is a proposal which comes to us for the first time?—That is a reduction of 6d. At present the lamps of the town are only lighted ten months in the year, and that is partly from the very high price. We are anxious to increase our area of lighting, and light the whole year, because we do not think it safe for two months to be in darkness.

You have power to pay for your own gas by meter, and, in that case, if there is any difficulty about the matter, you could take it into your own hands?—It would be very difficult to put down a meter for every few lamps.

Supposing the cost of producing gas should be lowered, you do not think it probable that the gas company will ever reduce the price of gas?—We do not think it likely, judging from the balance-sheet.

Cross-examination continued; I remember, about the year 1871, that for 18 months the British Gas Company charged only 3s. for their gas, but the bills came to more than when they charged 3s. 6d. The corporation believe they would be able to manufacture better. It could be proved in evidence that if the works at Hanley had been managed as well as those at Stoke, there would have been an additional profit of £100,000 on the last 10 years. We should also save the directors fees, which amount to nearly £800.

Mr. JEUNE: Are you aware that the whole expenses of the central management comes to less than 1d. per 1000 feet?

Witness: I am not.

The expenses of the central office are £700?—We should save a little more; about £800 or £900.

You would want somebody to do the secretary's work?—We should want the people we have now; a town-clerk and an accountant. The auditors make no charge. We should also be on the spot, and know how to buy the coals well and sell the residuals.

If it is the case that the price of coals is the average price, and the residuals are sold as well as they can be, that objection of yours falls to

the ground?—During the time there was a very high price charged for coals, the Stoke Company made a contract, and the British Company had to pay the market price.

Re-examined by Mr. MOULTON: I do not know of any substantial difference, between the condition of Hanley and of the surrounding places, which ought to affect the price of gas, excepting that Hanley is much larger than any of the others, which, in my opinion, ought to diminish the cost.

Mr. MOULTON: Have you formed any opinion as to whether it was an authorized act on the part of the British Gaslight Company to charge that £3000—or whatever it was they paid—to the Hanley gas consumers?

Witness: I can only say that when we began to investigate the accounts for the promotion of the present Bill, we were much surprised to find it had been charged against the consumers. In examining those accounts we also found that that made up the real dividend they claimed to be entitled to.

The COMMITTEE: Will you show us the item you object to?

Mr. MOULTON: You will see the item, "By amount paid to the Hanley Gas Consumers Company, Limited, on account of costs," something over £2000. On the next page, in the next year, you find that was not completed, and they put down as a total amount £3300. They wrote off £500 of it in that year, £824 in the next year, £500 in the next year, and you will find in the next year they quite extinguished it, by including it, in their professional charges and incidental expenses, in the profit and loss account, and not in the place where it had usually been put in.

The CHAIRMAN: I want to see how you would have had them charge it otherwise, and how it is to the detriment of the consumers in being charged that way?

Mr. MOULTON: It has been said that the deficiency of the dividend of £10,000 is going to be spoken of as an item to which they have a claim, on the ground of a statutory enactment that past dividends can be made up in prosperous years, and there is £3000 of that which ought never to have been put down to revenue at all.

The CHAIRMAN: What would you have had it paid out of?

Mr. MOULTON: Out of capital.

The CHAIRMAN: Then you must have paid the 10 per cent. upon that capital.

Mr. MOULTON said it would have been 7½ per cent., which would have made their borrowing powers more nearly exhausted, and the company would have had to apply to Parliament again.

Re-examination resumed: On Sunday, Sept. 11, 1875, the supply was particularly bad, and the churches and chapels were in semi-darkness. The idea of purchase was first forced upon us by the generally bad supply of gas. We were compelled, as a governing authority, to take note of the complaints which were being continually made to us.

The COMMITTEE: Will you have the goodness to read what is marked on that paper in the opening speech of your counsel?

Witness: You mean that the old commissioners had power to erect gas-works, and when the corporation took over the duties of the commissioners, they also took over the power under that.

Then you consider you are in the position of the commissioners?—Undoubtedly, and under that section we are entitled to set up competing gas-works of our own; but we thought it better to come and ask the committee to let us buy up the works of the existing company at a reasonable price.

Mr. *Robert Heath*, examined by Mr. RICHARDS.

I am M.P. for Stoke-upon-Trent, of which the municipal borough of Hanley forms the principal town. I am also a magistrate for the county of Staffordshire, and a coalowner and ironmaster at Smallthorn and elsewhere. I employ 2000 men at Smallthorn, and half that number at Tunstall. I have read the Hanley Gas Bill, and, generally, I approve of it. Three of the gas-works in the borough of Stoke-upon-Trent are in the hands of the corporations, and I think it rather hard that Hanley is not allowed the same privilege, as it is the principal town. So far as I know the particulars of the other purchases, they were very much more favourable to the different corporations than those now proposed, and if I was the purchaser I should prefer to purchase upon those conditions rather than the conditions proposed by the present Bill. I believe there is a Bill from Newcastle-under-Lyme in Parliament this year for the extension of the borough, and for power to purchase the gas-works, to which, I believe, the company are not opposed, so that Hanley and Tunstall will be the only places in which the gas-works are not in the hands of the corporations; but Tunstall is included in the present Bill.

Cross-examined by Mr. JEUNE: All the cases spoken of have been the result of private negotiation between the parties.

Mr. JEUNE: That forms no precedent, in your opinion, for a case where people do not agree to sell?

Witness: No. It is considered wise that Corporations should own gas-works, and I think the people of Hanley have a perfect right to have the supply in their own hands.

Because other people have agreed to sell their gas-works, are we, therefore, compelled to sell ours?—Or else Parliament should grant the corporation the privilege of putting up new works.

Mr. *Edwin Powell*, examined by Mr. MOULTON.

I am a magistrate of the borough of Hanley, and have been a member of the Town Council for 13 years. I was mayor in 1871, and at present am chairman of the Finance Committee. I have three earthenware and china manufactories in the borough of Hanley, and employ over 500 hands. We have more than 530 burners. My conviction is that the supply of gas has been inefficient and impure, and for a long time we have paid a higher price than we ought to have done. I have myself often taken complaints to the town council of the quality of the gas in my manufactory and in my house. I have an instance before me where, in a room 15 feet by 14 feet, frequently night after night and week after week, with three burners, I could not see to read the newspapers.

By the COMMITTEE: That has been the case for a period ranging from 1865 down to 1874. We might go on for a period of five or six weeks when the gas would be all right, both in quantity and quality, and then we would have a period of several weeks when it would be difficult to read with the three burners.

Examination resumed: I was quite cognizant of the action of the town council in appointing a gas analyst on account of the bad gas supply. I was also one of the deputation who waited upon the gas directors in London with a view of obtaining the works by private treaty. In the course of our conversation with the directors it was intimated that if we would give them three times the value they would be disposed to sell to us. It was then suggested by us that, as they had not been earning their statutory dividend, the corporation might offer them annuities on the amount of their capital covering such statutory dividends, and we were asked whether the corporation would make such an offer, and the corporation did so, the offer being much more liberal than Burslem and other towns round bought their works for.

By the COMMITTEE: Those annuities were proposed to be secured on the borough rates.

Examination resumed: The corporation have not in any way a bigoted attachment to that method of fixing the price, and we are quite willing it should be fixed in any way that could be settled between the parties. I have heard the evidence which has been brought forward, and I think the corporation ought to have the power of supplying themselves. Our consumption as a corporation is something over £2000 a year, and the corporation would also listen to and redress complaints. Popular opinion would lead them to give a better supply of gas, and do away with complaints. I am also satisfied, having looked through the accounts, that we are quite able to conduct works of that kind satisfactorily and profitably, both to gas consumers and ratepayers.

Cross-examined by Mr. JEUNE: I was one of the promoters of the Hanley Gas Consumers Company in 1866. We were not wholly defeated on that occasion, because we made out so good a case that the committee of the House of Lords ordered the British Gas Company to pay our costs, to reduce the price of their gas, and to give us a better quality; so that we gained an advantage by it. More or less since 1865 the gas has been thoroughly unsatisfactory, by which I have been seriously inconvenienced, but I have not personally complained at the gas-works, because, as a member of the corporation, I thought the proper course would be to complain through them. Complaints may have been made by my firm without my knowledge, but I have made no complaint personally. Our analyst, Mr. Sparkes, only took an analysis now and then, but just at the very time when the gas was worse for days together, Mr. Sparkes was not there to test it.

Mr. JEUNE: Was it not the duty of the analyst to go there at those times? Do you mean to say he has neglected his duty?

Witness: No. I say that whatever analyses he made were correct, but at other times when he did not go the gas was not equal to what the Act required.

When the gas was very bad why did you not ask Mr. Sparkes to go and analyze it?—I am not a member of the Gas Committee, and it is not within my province.

Cross-examination continued: If you press the matter I can point out six definite Sabbath evenings when the congregation were not able to read the Church Service, and I mentioned the matter to the council immediately afterwards, but I did not say anything to the analyst because I did not consider it my duty to interfere with the chairman of the Gas Committee, who has control over the matter. I suppose the analyst examined the gas during the years 1875 and 1876. I believe he has done his work properly.

Mr. JEUNE: I suppose you do not know the results; but, if the result of every one of those tests by your own analyst, with one single exception, shows that the gas was over 14 candles, and, on many occasions, over 15 candles, what do you say to that?

Witness: I am not aware of it. [The report of Mr. Sparkes was here handed in.] Notwithstanding that report, I maintain my opinion that throughout the time the gas has not been good. There are many peculiarities about the gas. A complaint has been made to me that within the last two years the gas accounts of consumers have marvellously increased, although the price has been the same. In one case a household, having ten or a dozen burners, lived in the same way and used the gas in the same manner, and yet during the last two years their gas accounts in some marvellous manner have increased as much as 20 per cent. I may also mention that in my manufactories, where we were not using anything like the quantity of gas in 1875 that we were in 1873, we had to pay to the amount of £174, or something like £40 more than in 1873.

Mr. POPE: I wonder whether you looked after your meter?

Witness: Yes; there is no doubt it went through the meter.

Cross-examination resumed: I knew the amount was not used, but my inference is that something else than gas passed through the meter, although I cannot account for it.

The CHAIRMAN: If the gas is very bad, has it ever occurred to your town council to use the power they possess, and start independent gas-works?

Witness: It has not, so far as I have heard.

Because that would be a much smaller cost than buying these gas-works?—In the end, no doubt, it would involve loss, because of the inconvenience of a double set of mains through the town; and one set is quite enough to supply us.

Mr. *Henry Cartledge*, examined by Mr. MOULTON.

I am a magistrate and alderman of the borough of Hanley, and have been connected with the council for 12 years, having been twice mayor. There is no question but that 19-20ths of the burgesses of the borough are most decidedly in favour of the corporation possessing the gas-works. There has been scarcely a meeting at which some complaint or other was not made with respect to the quality and quantity of the gas. Shortly after November, 1875, a very important deputation—consisting of the leading medical men and manufacturers of the district waited upon my successor—complaining very bitterly about the quality of the gas at that time. The result was the deputation previously spoken of, when, to our surprise, we received a letter stating that the company declined to sell.

Cross-examined by Mr. JEUNE: My attention has not been specially called to the powers we have under the Act of 1875.

Mr. JEUNE: Do you not know that if you are dissatisfied with the supply you can set up a supply of your own?

Witness: Yes; but we do not want to make such a mistake, for I think it would be a great mistake, because we should be in competition, and we do not want that. We wish to obtain possession of the gas-works without the expense of erecting new ones, and we are ready to pay the full value for them.

(To be continued.)

Legal Intelligence.

SOUTHWARK POLICE COURT.—THURSDAY, JULY 26.

(Before Mr. BENSON.)

CONVICTION OF A LAMPLIGHTER FOR NEGLECT OF DUTY.

Thomas Slee, a lamplighter in the employ of the Surrey Consumers Gas Company, was summoned for neglecting to extinguish the lights of 120 street-lamps in Bermondsey, thereby entailing a loss to the company.

Mr. W. EDWIN appeared to support the summons.

Edward Bloomfield, foreman of lamplighters in the service of the company, said the defendant had been in their employ about two years, and a certain district was assigned to him. On the 14th inst. witness found a number of the lamps in defendant's district alight at 11 o'clock in the day. He was compelled to extinguish them himself. When told of his inattention to his work, the defendant said he could not help it. He went to a wedding the previous day, after he had lighted his lamps, drank too much, and was unable to get up in the morning. He thought his mate might have done his work for him. Witness reported the circumstances to the company.

Mr. *Beckwith*, an inspector in the employ of the company, said that there were 120 lamps left lighted, and he estimated the loss to the company to be about 10s. The defendant's conduct had been very irregular lately, and he was under notice to leave.

Mr. BENSON told the defendant there was no excuse for such neglect, and fined him 10s. and costs.

Miscellaneous News.

METROPOLITAN WATER SUPPLY AND THE EXTINCTION OF FIRES IN THE METROPOLIS.

EXTRACT FROM THE REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS ON THE METROPOLITAN FIRE BRIGADE.

London, and by this term is meant an area considerably larger than the Metropolis technically so called, is supplied with water by eight companies. These companies are commercial associations, from time to time established by private Acts of Parliament, primarily for the purpose of selling water for the daily consumption of the inhabitants within their districts.

They are controlled in common by certain general enactments, the Metropolis Water Acts of 1852 and 1871, and provisions in the Fire Brigade Act of 1865, also the Water-Works Clauses Act of 1847, which is expressly applied to them. But, subject to these general enactments, they are governed by their own special Acts, each company having an independent area, a separate system of pipes, and peculiar regulations suitable to its own circumstances. None of the companies are under any obligation to provide water sufficient for the extinction of fires; all that is required of them under the general enactments above mentioned is to allow the gratuitous use of their water for this purpose, and to grant certain special facilities, which will presently be noticed. But, except in these particulars, the companies throughout the Acts, whether public or private, are treated as mere purveyors of water for ordinary consumption, and are authorized, in carrying on this business, to consider solely the convenience of their customers and the profit of their shareholders. The result is that whilst what is needed for the extinction of fires is an immediate and ample delivery of water, the three main conditions by which such a delivery is ensured—viz., constant supply, high pressure, and large pipes, are regulated with a view, not to the extinction of fires, but to the domestic and manufacturing requirements, which are far more easily satisfied.

The convenience of constant supply to ordinary consumers needs no explanation, but its value for the purposes of fire extinction is of yet greater moment. With a constant supply, a fireman, without waiting for a turncock, can obtain water immediately from any pipe, but under an intermittent system it is useless for him to have access to the pipe, unless it happens to be charged at the time; he must needs wait for the turncock to turn the water on to the point of delivery, and in the meantime the fire will advance possibly beyond control. The companies are under no statutory obligation to give a constant supply. They can be required to do so either by the Metropolitan Board or by the Local Government Board. But no such requisition has been made on account of the cost that would be occasioned by the necessary alteration of the house fittings. As a fact, two only of the companies—the East London Company and the Kent Water-Works Company—have for their own purposes established a constant supply, and that only in parts of their districts; and in addition to this, the mains (all the mains of some companies, and some of the mains of other companies), as distinct from the smaller service-pipes which lead off the water from the mains to streets or groups of houses, and from the still smaller communication-pipes which distribute the water to the individual customers, are constantly charged night and day. But, as will presently appear, under the existing system of fire-plugs, water cannot be drawn direct from the mains.

The amount of the pressure on the water in the pipes is a question of primary importance to the consumer, as determining the level at which his cisterns, &c., can be supplied. But it also limits the means available for the extinction of fires, since it affects the rapidity, and, therefore, the volume of discharge, and also the height of a jet deliverable from the extremity of the pipes. It will be found, however, that the service level alone is enforced by the law. In order to attain the elevation from which pressure is derived, the whole of the water provided for the Metropolis by each of the companies has to be pumped. In some cases the mains are filled direct from the pumps, in others by the intervention of a reservoir, from which the water is allowed to gravitate, the advantage of the latter mode being that so long as there is water in the reservoir there will be a supply in the pipes, whereas in the former mode if the pumping is interrupted the supply at once fails. The degree of elevation or pressure is in each case regulated by the special Act. In the systems of two companies the statutory pressure is relative, being such as to ensure delivery at a certain height above the street level; in others, the pressure is fixed absolutely with reference to a datum; but in the latter case no less than in the former the limit is determined solely with a view to meet the service for domestic supply. Accordingly, the statutory limit is not strictly observed, the companies in their own interest frequently giving extra pressure where such is required, or reducing pressure, where they can do so without inconveniencing their customers. For instance, the East London Water Company, who may be called on to give such pressure as will conduct the water 40 feet above the pavement, actually give less than that pressure in certain portions of their district; they also give less at certain hours, as at night, when less water is needed for manufacturing and domestic uses, although, for the purpose of extinguishing fires, water is far more likely to be required in the night than during the day.

Similar observations apply to the size of the pipes, which is one of the main conditions that determine their delivering capability. Their dimensions are fixed solely with a view to the demands made on the companies by their consumers. There are in the Metropolis, notably by the riverside, many warehouses, which, from their requiring only a small quantity for daily use, are supplied through an extensive length of narrow pipes intermittently charged at low pressure, although from their extreme height, and from the vastness of their contents, at once precious and highly combustible, these same buildings more than others ought to be protected from fire by means of a high pressure supply delivered through large pipes, either themselves constantly charged, or in close proximity with mains.

Speaking generally, there are two modes of drawing water from the pipes for the extinction of fires—viz., plugs and hydrants. The subject of hydrants will be dealt with in a later part of the report. For the present your committee would confine their observations to fire-plugs, which alone, with few exceptions, are used in the Metropolis.

A plug, as its name denotes, is a stopper, usually made of wood, driven fast into a hole made for the purpose in a water-carrying pipe. The stopper is drawn when water is wanted, and replaced when enough has been obtained. Drawing the plug is a comparatively simple operation, which can be done by the fireman, if (as is generally, but not always, the case) he knows where the plug is placed. The fireman accordingly always carries with him tools for that purpose. The plug, however, cannot be replaced whilst the water is flowing, by reason of the pressure being too strong. The water has first to be turned off, and this can only be done by the turncock.

Plugs are not used on mains, in the Metropolis at least, on account of the pressure; the plugs employed are on the service-pipes. A plug, as above described, merely releases the water; and in order that the water may be used, a fire-engine, whether worked by hand or steam, is requisite and has to be brought up to the spot. The water is either allowed to flow out on the ground and then dammed up into a pool, or is made to run into a portable cistern carried by the firemen for the purpose; from this pool or cistern the engine feeds itself through its suckers, and by means of its power projects the water through a hose to the requisite height on the burning building. Occasionally a stand-pipe or dummy is forced into the plug-hole for convenience; but however the engine is supplied under the plug system, an immense quantity of water always runs to waste.

The fixing of plugs on the pipes was originally assigned to the churchwardens of the several parishes, as the local authority at that time charged with the duty of extinguising fires. Subsequently, by the Water-Works Clauses Act, incorporated in the special Acts of the companies, the churchwardens were empowered to require the companies, at the expense of the parish, to fix fire-plugs at convenient intervals.

By the Fire Brigade Act all these powers of local authorities as to fire-plugs were transferred to the Metropolitan Board, to whom they now belong. The same statute also expressly enacted that each water company should provide, at the expense of the Board, on any mains or pipes within the Metropolis, plugs for the supply of water in case of fire, at such places, of such dimensions, and in such form as the Board might require.

The Acts authorize the firemen to act where they can without the intervention of the companies turncocks. With this view the companies are bound to keep for inspection maps showing their pipeage and the spots where the screw-cocks are placed for regulating the service, and if required must give extracts or copies to the Metropolitan Board, they must also deposit keys of the fire-plugs at places prescribed by the Board, and the firemen belonging to the brigade may use these plugs, as they may deem necessary, for the purpose of extinguishing any fire, and may cause water to be shut off in order to procure a better supply or pressure at the point where delivery is required. To a great extent, however, these powers and provisions are unavailable, by reason of the intermittent character of the water supply, the absence of appliances for obtaining direct access to the mains, and the complexity of the pipeage system. Practically the firemen are dependent on the turncock to turn on the water at the required point, to shut it off from other points for the purpose of obtaining a fuller delivery, and to shut it off altogether when the fire is extinguished, in order that the plug may be replaced.

Such, then, being the system of fire-plugs in use in the Metropolis, your committee would point out that it is one which, however worked, must always be unsatisfactory. It is wasteful of water; and waste of water means a corresponding waste of power of delivery from the pipes. It cannot take advantage of the constant supply in mains (which, even under an intermittent system, are generally kept filled), because plugs cannot be used on mains. It cannot take advantage of any pressure that there may be on the water in excess of what is necessary to feed the engines; indeed, any extra pressure only adds to the waste of water. But these drawbacks are insignificant by the side of the fundamental defect that the system does not admit of anything being done towards extinguishing a fire, until the firemen have arrived at the spot with the engine, and in most cases the turncock also. With the utmost promptitude the arrival of the firemen and the turncock cannot take place until after the lapse of a considerable number of minutes.

This defect is of vital importance, is inherent in the system, and, beyond a certain point, incurable.

The matters, then, for consideration seem to be how far the evils of the system are mitigated by the efficient arrangements on the part of those concerned in working it—the Metropolitan Board and the water companies—and whether it is practicable to introduce a superior system as a substitute.

With respect to the Metropolitan Board, the constitution of the brigade has been already described; it is sufficient here to repeat that a considerable addition to the number of men, stations, and engines, is beyond question indispensable, if the force is to be rendered adequate to the working of the system in which it is engaged.

With respect to the water companies, in past years complaints were made against them by the Metropolitan Board that the turncocks were often behindhand, and that the supply of water was insufficient. The companies had much to say in their defence; but, at all events, these complaints have of late abated. The companies appear to have taken pains to secure the prompt attendance of the turncock; and usually the turncock arrives before the firemen. In the year 1875 there were only four cases in which short supply of water was made the subject of a formal report by the brigade. And, generally, it seems to your committee that the companies cannot be charged with any failure of duty.

But this does not mean that, in the judgment of your committee, the arrangements are satisfactory; on the contrary, there is abundant evidence of the prejudicial effects resulting from want of concert between the Metropolitan Board and the companies, and from the several companies being independent of each other, under no statutory obligation to co-operate in the extinction of fire, and, indeed, scarcely justified by their constitution in incurring expenditure for that purpose. Thus the turncock does not, as at Liverpool, live at the brigade station, and accompany the engine to the fire; there is no provision for communicating with him by telegraph, nor is it even recognized as the duty of the brigade to see to his being summoned. And though it may seldom happen that the supply of water is so short or so tardy as to disappoint expectations formed on the known limits to the capabilities of the companies, and therefore to constitute a legitimate ground of complaint, it is obvious that the engines of the fire brigade would be able more speedily to suppress fires, if the water supply were constant instead of intermittent, and if the pipes were larger and the pressure higher.

To pass now to the consideration of the other alternative, hydrants.

Hydrants vary much in their construction; but for present purposes a hydrant may be roughly described as an appliance permanently attached to the water-carrying pipe, so constructed as to give direct communication with the water by means of opening a stopcock, and to admit of a hose being readily and securely screwed on. When water is wanted the hose is screwed on, and the stopcock opened; the water then flows at once through the hose into the engine, if an engine is used, or as a jet if there is no engine. When enough water has been procured, the stopcock is shut, and the hose unscrewed. There is no waste, and all the operations —the opening and shutting of the cocks, the screwing and unscrewing of the hose—are of the simplest character.

Even as a feeder to an engine, a hydrant is superior to a plug, alike whether the supply is constant or intermittent. It avoids all waste of water, securing to the full whatever quantity the pipe is able to deliver. It can be attached as safely to a main as to a service-pipe, and, as already stated, the mains are, in many cases, kept constantly charged, and, of course, deliver a much larger quantity of water. Several instances have been brought to the notice of your committee, where fires have been ineffectually dealt with, from the engines having to wait for a supply in the service-pipes, or from such supply proving insufficient, whilst close at hand was the main, with abundance of water, which could have been immediately available if only there had been a hydrant. What, however,

especially distinguishes a hydrant from a plug is that, without the intervention of an engine, it can itself be used as an engine for the purpose of throwing a jet. The water of the pipes, when liberated from the opening of the stopcock, discharges itself at the end of the hose in a jet, which is capable of being directed by means of the hose towards any given point. The elevation and volume of this jet, and consequently its utility, vary according to pressure and other circumstances.

As already stated, the earlier Acts contemplated fire-plugs as the means to be used in the Metropolis for the purpose of drawing water from the pipes for the extinction of fires. Hydrants were first recognized by the Water Act of 1871, which in this respect effected two important changes.

In the first place, it declared that in that Act, and also in the Fire Brigade Act of 1865, the term "fire-plug," and the term "plug" should include hydrants and all other apparatus necessary or proper in connexion with the companies pipes for the supply of water in case of fire. Consequently it gave power to the Metropolitan Board, at any time and place, whether there was a constant supply or not, if they should think fit to incur the expense, to cause hydrants instead of plugs to be placed on any mains or pipes, the work to be done by the company, but paid for by the Board.

The second change effected by the Act was limited to the case where a company furnishes a constant water supply. In that case the company were empowered by notice to call on the Board within two months to exercise their power of specifying to the company what plugs or hydrants were to be put up in any part of the companies water limits having a constant supply; and if the Board failed to make this specification within two months, power was given to the company, if they thought fit, to provide in and for that part of their water limits such plugs or hydrants for the supply of water in case of fire, at such places, of such dimensions, and in such form as to the company might seem necessary or proper, the cost of providing all such plugs and hydrants to be at the expense of the Board.

The complaint of the water companies is that these enactments have been frustrated by the persistant refusal of the Metropolitan Board to take advantage of them. The mains throughout the Metropolis are, in many cases, kept constantly charged; and two of the companies, the East London Water-Works Company and the Kent Water-Works Company, are, by degrees, extending constant supply over their service systems; but notwithstanding this, and in spite of frequent representations, the Board have declined to adopt the hydrant system. In only one instance have they voluntarily set up hydrants—viz., in the new street recently constructed under the name of Northumberland Avenue. In two other instances action has been forced upon them. The Kent Water-Works Company, on extending the constant supply to Rotherhithe and Deptford, gave formal notice to the Board in pursuance of the Act of 1871, and thereupon the Board erected certain hydrants. More recently the same company gave a similar notice respecting the Plumstead district, and on the Board abstaining from taking action during the prescribed period, put up 60 hydrants, the cost of which, in accordance with the Act, has been defrayed by the Board. Similar applications have been made by the East London Water-Works Company, but have been disregarded by the Board.

The companies contend that there is nothing to prevent hydrants being successfully used as substitutes for engines, or as auxiliaries to them, at all events wherever constant supply is given, that fire-plugs are an antiquated and inferior device for procuring water for fire extinction, and that their continued use is contrary to the interest of the metropolitan ratepayers, whose property it is the duty of the Board to protect by the most efficacious means. The companies also feel specially aggrieved at the adherence to a system which wastes their water unnecessarily, diminishes the available pressure, and exposes them to the charge of not providing sufficiency of water at places where an ample supply might be immediately drawn by means of hydrants placed on the constantly charged mains.

The Board, without questioning the superiority of hydrants, where the conditions are favourable to their employment, deny that these conditions are to be found under the present constitution of the metropolitan water supply. They consider that, under existing circumstances, hydrants would be but a doubtful advantage; at all events, not one equivalent to the enormous cost which would be entailed by change from one system to another.

(To be continued.)

PROPOSED PURCHASE OF THE STOKE GAS-WORKS.

At the Monthly Meeting of the Stoke Town Council on the 18th inst.—the Mayor (Alderman Copeland) presiding,

The Special Committee appointed to consider the question of the proposed purchase of the Stoke and Fenton Gas Company presented the following report:—

As a first and necessary step, the special committee sought and obtained an interview with the directors of the company, and, accompanied by your clerk, met the directors on the 12th inst., and now present the result of their inquiries.

Your committee feel bound to state that the directors of the gas company manifested the utmost willingness to give all necessary information concerning the past history and present condition of the company's affairs, and not only gave the information asked for, but instructed their manager to furnish any other details which might be required by the committee.

Your committee wish first to express the convictions produced upon them by this interview. They feel satisfied that the directors, as a whole, are not desirous of selling their concern; that no reduction or alteration in the terms proposed by the gas company will be made; that unless the council speedily decide to accept the offer as it now stands, it will be withdrawn, and that it will be many years before the corporation will have another opportunity of purchasing the gas-works, and that, when they have, it will be at a much higher price.

From a comparison of the purchases made by other corporations, they are satisfied that, whilst the amount asked is a high price, yet, considering the actual position of the company's affairs, it would to a certainty be a profitable investment for the corporation.

The committee beg to submit the following items of information obtained:—The company's paid-up capital is £34,000; for this we have the word of the chairman of the directors, who, in giving the information, observed, "that unless they were to be regarded as rogues and cheats, they ought to be believed." The profits for the last seven years have averaged £5900 per annum, which, after paying statutory dividends, leaves a clear profit of £2500 per annum; £13,000 of profit has been expended as capital, making the actual cost of the works £47,000. Mains will last from 50 to 60 years, and there are no mains in Stoke that have been in use 30 years, with the exception of one short length, about 50 yards, in Liverpool Road, and no mains will require renewing for many years, unless the requirements of the town demand larger service. The loss by leakage for the year 1876 was 10·9 per cent., being almost the minimum of leakage known. This conclusively proves that the mains must be in a good condition. The average daily make of gas was 300,000 feet per day; the present works are capable of producing 530,000 feet per day, or more than 80 per cent. above what is now being made, and if the demand should increase to almost double the present consumption, the existing works would suffice.

Your committee carefully examined the machinery, &c., belonging to the company, and they find that the engines, &c., are almost entirely new, and are in excellent order, the gasholders (which will last 25 years) are respectively three, seven, and ten years old, and the stock of new materials on the premises is sufficient to last, with very little addition, for some time to come. Should more extensive works be required, there is ample spare land both at Stoke and Fenton for such extension. Should the present offer be accepted by the corporation, say before March next, exceptional benefits of a pecuniary character would result to the corporation.

The committee were anxious to ascertain if any arrangement could be made with the directors for the payment of the purchase-money by annual payments, covering interest and principal. The directors declined to enter into this question until the purchase was agreed upon, and said they should then be disposed to consider any proposal the corporation might have to make as to mode of payment. If such an arrangement could be made with the company for payments, £5000 per annum would in the course of 28 years 9 months pay off the principal and interest, and would leave the surplus profits to be devoted to the reduction of the rates.

Your committee anticipate that under the management of the corporation some saving even in the present expenses would be effected, and that the consumption of gas would materially increase, and thus additional profit would be made. But if the profits should remain at the average of the last seven years, £1000 per annum could be devoted from the profits of the gas-works to the reduction of the rates, or in improvements.

Your committee cannot conceal from themselves the fact that a large expenditure of an unremunerative character will fall within a very few years on the ratepayers, and they believe the profits arising from the purchase of the gas-works will do much, if it does not remove altogether the burden that would otherwise fall upon the corporation.

Your committee have thought that they were justified in making inquiries as to the prices realized by other gas companies, and comparing them with the terms offered by the Stoke Gas Company, and upon careful examination they believe that the offer now made by the Stoke Gas Company is as favourable to the buyers as any transaction of a similar nature that could be pointed out. It has been stated that no case could be found where a gas company had sold to a public body at 25 years purchase. This is an error. Bradford bought at 38 years purchase, and made profits during the first four years of £45,000, after paying interest on the amount of purchase. Bolton paid 10 per cent., free of income-tax, and a bonus of £2 on every share of £16 10s., or the bonus and income-tax more than we are asked to pay; in 1874 they made more than £4000 net profit, and in 1875 over £6000. The Hereford Corporation paid £861 for every £100 share, or 86 years purchase of the original capital, and with all this it is doing well. Dumbarton sold at 25 years purchase of the annuities. The Dewsbury and Batley Corporation bought at 25 years purchase of the maximum dividends—the same terms as are offered to this corporation. Nottingham bought at 27 years purchase of the maximum dividends, or two years more than we are asked to give; and more, the gas company had not been able to pay maximum dividends, and the price paid was 29¼ years purchase on the dividends paid. Birmingham bought at 25 years purchase of the dividends paid by the gas company previous to the proposal of the corporation to buy the works, and it is said that Birmingham will annually have surplus profits variously estimated at from £25,000 to £40,000. Longton has been frequently referred to as a much better bargain for the corporation, but this is not so. The Longton Corporation, it is true, have only to pay £74,250 for a capital of £40,000. This works out to a 22½ years purchase on their statutory dividends, but it must be borne in mind that the profits from the Stoke Company during the last seven years have been an average of £5900 per annum on a paid-up capital of £34,000, whilst the average for the same period in Longton has been only £3100, on a paid-up capital of £44,000. As each corporation is proposing to buy not merely capital but profits also, the relative purchase stands thus:

Longton pays £74,000 = £3100 × 24 —*i.e.*, 24 years purchase of the profits.
Stoke would pay £85,000 = £5900 × 14½—*i.e.*, 14½ years purchase of the profits.

Mr. Turner moved the following resolution:—"That the special committee's report on the gas-works purchase be taken as read; and that in the opinion of this council it is desirable that the manufacture and sale of gas in this town should be under the control of the corporation; and that the General Purposes, Highway, and Lighting Committee be instructed to negotiate for the purchase of the property and rights of the Stoke and Fenton Gas Company on the terms of the company's letter of June 7, 1877; and that the Fenton Local Board be requested to say if they are desirous of joining in such purchase, and, if so, that they be requested to co-operate with the above-named committee."

Alderman Dickinson referred to the places quoted in the report, and specially spoke as to the Leeds purchase being a failure. He could not see what really would be gained by the town council becoming the purchasers of the gas-works.

Mr. Leason said the statement with regard to the Leeds Gas-Works purchase was incorrect, the town-clerk of Leeds having written to that effect. With respect to any difficulty which might be feared as to Fenton not approving of the gas-works purchase scheme, or opposing it, he thought the matter need not cause any trouble to the council. If, as had been stated, Fenton consumed one-third of the gas supplied by the gas company, he thought no difficulty would be experienced in arranging that Fenton should have a third share, providing, of course, that they paid a third proportion of the purchase. All these matters would be fully discussed, for this question could not be decided with closed doors—the ratepayers would have to be consulted. He did not think that any committee of the House of Commons would sanction Fenton establishing new works, as the works existed, and Fenton could join in part proprietorship. It would be easy for there to be a clause inserted in the Bill for Fenton to take a third share in the profits, upon their paying a third proportion of the purchase-money, therefore the question of Fenton, he conceived, did not alter their position.

Mr. Kirkham opposed the motion, on the ground that it would entail a loss upon the ratepayers, and end in dissatisfaction. He should like the council to be fortified by the opinion of an eminent engineer as to the real value of the works. The gas company had put down £85,000 as the minimum price of the works. They had also expressed their willingness for an engineer to give his estimate of the value of the works, and they intimated that they would be willing to take what might be over £85,000, but would not take any estimate that was below. The special committee did not give their own impression as to the desirableness of purchasing the gas-works; and he regretted that he had not had an opportunity of more fully considering the subject, specially as to the company's financial returns. He pointed out that in several years the profits were exceptionally high, owing to the company having made a good contract for coal before it ran up to such a high price, and when the residuals yielded a good return. He estimated the average profit per year for the last seven years at £3793; and, looking at the amount of the purchase-money, and consequent repayment of principal and interest, he failed to see how the town would be advantaged by the purchase of the works.

Mr. Thomas said the gas-works for many years had been a profitable concern; and the council ought not to lose the present opportunity of purchasing them on behalf of the town.

Mr. Perrins said it was somewhat doubtful whether coal gas would not be superseded by some other method of lighting. Although he was in favour of purchasing the gas-works, he thought the council had not given the matter sufficient consideration. Before pledging themselves to the purchase, it would be wise to employ a competent engineer to enter into an examination of the works, so as to make it quite clear to the council whether or not they were getting proper value for their money.

After some further conversation, the motion for the adoption of the report of the committee was put, and carried by a large majority.

DEVONPORT GAS AND COKE COMPANY.

The Annual Meeting of Shareholders was held on Tuesday, July 24—Mr. R. C. Smith in the chair.

The Secretary (Mr. Willing) having read the notice convening the meeting, the following report was presented:—

Your directors have much pleasure in submitting the thirty-third annual report, together with statement of accounts showing the receipts and expenditure for the past financial year.

The loss of revenue arising from the successive reductions in the price of gas, and the lower rates obtained for coke, has been partially compensated by the continuous decline in the tariffs of coals, iron, and freights, which, however much to be regretted from a national point of view, is exceptionally favourable for the economic production of gas.

The renewal of mains and service-pipes now in progress has contributed to check the loss sustained by leakage, or unaccounted-for gas, which is now reduced to 13 per cent.;

and a further improvement may yet be looked for in this direction as the work of renewal proceeds.

Another satisfactory feature is the large increase in the consumption of gas, consequent on the reduction of price and the general improvement in the trade of the borough.

The effect of these several economies has been to produce a surplus where a deficiency was estimated, and your directors have the satisfaction of announcing a further reduction in the price of gas of 3d. per 1000, commencing with the current quarter, the price being now reduced to 3s. 3d. per 1000 cubic feet.

It is also proposed to reduce the charge for the public lamps by the sum of 4s. per lamp, making, together with the like sum previously remitted, a reduction of 8s. per lamp per annum from the contract price.

Several important improvements in the works have been effected during the past year, and others are now being carried out. A contract has been entered into with Messrs. Wilcocks for excavating ground for gasholder-tank, and, the work being nearly completed, arrangements will shortly be made for proceeding with the construction of the tank.

After payment of the interim dividend, providing for all outstanding liabilities, and transferring the sum of £750 to the reserve-fund, there remains a disposable balance of £2802 7s. 3d. Your directors have, therefore, much pleasure in recommending that a dividend be now declared of 5 per cent. on the original shares, and 3 per cent. on the guaranteed shares, free of income-tax, making together the sum of £2110 16s. 7d., and leaving a balance to be carried forward to the next account of £691 10s. 8d.

A subscription of two guineas has been made to the Devonport and Western Counties Association for the Relief of the Blind, for which your approval is now solicited.

Two of your directors—Messrs. Richard Oram and Thomas S. Honey—who retire by rotation, being eligible, offer themselves for re-election.

It is with deep regret that we record the death of one of your auditors—Mr. W. M. Rickard—who had long been associated with this company. Your directors have availed themselves of the efficient services of Mr. Charles Bearblock to assist in auditing the accounts for the past year, and it now remains with the shareholders to fill the vacancy caused by the death of the late auditor.

Working Account, for the Year ending May 31, 1877.

Coals carbonized	£7,688	11	10	Gas-rental	£14,667	7	8
Lime, cartage, and sundry payments	541	6	1	Meter ditto	623	15	4
Wages	1,784	5	5	Fitting ditto	8	13	10
Lighting and repairs of public lamps	330	19	9	Sales of coke, breeze, tar, and other products	4,080	3	3
Renewals—				Fees for transfers	7	5	0
General repairs	910	8	7				
Plant and works	760	10	0				
Mains and service-pipes	333	2	11				
Meters	136	9	9				
Salaries, rates, and taxes	1,474	19	4				
Interest on loans	275	13	2				
Reserve-fund	750	0	0				
Bad debts	45	9	4				
Balance	4,355	8	11				
	£19,387	5	1		£19,387	5	1

The Chairman, in moving the adoption of the report and accounts, remarked that they compared very favourably with any former reports presented. They were in striking contrast with those of three years ago, when there was a great scare in consequence of the high price of coal. The company felt the benefit of the change that had since taken place, and that benefit was represented in the improved state of the balance-sheet. They had carbonized during the past year 500 tons of coal more than in the previous year, and yet the cost of coal was £400 less than last year. This extra consumption of coals implied a greater demand for gas, and this, he was happy to say, had been the case, for the consumption had been 6 per cent. more than last year. This was the only very large increase the company had experienced, as for several years they had been at a standpoint, notably from 1870 to 1875. The advent of the London and South-Western Railway had had a marked effect—trade had increased, hotels had been reopened and remodelled, business premises enlarged—and all this had naturally increased the demand for gas. The fact was that the consumption of gas in a town gave a very accurate indication of the state and condition of trade and business in that town. As a rule it might be taken that if the consumption of gas in a town was stationary, trade was stagnant; but Devonport appeared to have commenced improving, and he hoped it would continue to do so for many years to come. There was another satisfactory feature in the report. By the renewal of mains and service-pipes the company had reduced the leakage to 13 per cent., but they had not yet arrived at perfection in this direction. Financially, the result of economy, and the improvement in the demand for gas, had been far beyond their anticipations. In spite of the reduction in the price of gas, which would lessen their receipts by £1500, by the increased demand and lessened costs they had actually recouped themselves £1000 during the year, and that was really a more favourable result than was anticipated, or than they could have anticipated. There was one account, however, which was not quite so favourable, and it was the only unsatisfactory feature in the report—the amount derived from the sale of coke, breeze, and residuals. As the shareholders were aware, the last winter was an unusually mild one, and, consequently, the consumption of coke was very slack. It fell off, prices were reduced, and, therefore, the returns for coke this year were £400 less than they were last year. The figures in the account, however, did not show the falling off to that extent, because the directors had fortunately had an increase upon some of the other residuals—upon tar and ammonia, for instance—which had tended to reduce the deficiency on the coke, so that the actual deficiency over the last year was only £268. But for the improvement in the returns for the sale of tar and ammonia, the deficiency would have been much larger. As a general result, however, the balances came up very satisfactorily. They had been able, after meeting all liabilities, to pay the interim dividend, and to set aside £750 to the reserve-fund, and would still have a balance of £691 to carry forward to the next account. They had thought it desirable to carry forward a larger balance this year because, in consequence of the contemplated reduction in the price of gas, it was very possible that they might not stand on so even a keel next year as they did this. The renewals of plant and works, which were referred to in the last report, had all been carried out during the year, and were now working satisfactorily. The contract for excavations for the placing of a new gasholder, had been concluded with Mr. Wilcocks—a work which it had been hoped would by this time have further progressed; but delays had occurred, and it was not expected that the company would be able to get the new gasholder in working order for another twelve months. The shareholders would see that, notwithstanding the competition which they had had to meet in the shape of paraffin, benzoline, and mineral oils, the consumption of gas did not by any means diminish. Compared with all other artificial lights for cleanliness, for safety, for the saving of time and labour, and for economy, there were none at present produced that would compare with gas; and, looking at it in that view, they might consider it one of the greatest improvements which had been conferred by science on this generation. But they did not know what was in store. Since the last meeting there had been a new discovery. M. Jablochkoff had discovered means of separating and dividing the electric current, so as to convey it to any given point, in the same way as gas by means of pipes. Whether this would ever supersede gas he could not tell; but it was well to be prepared for such contingencies. Out of this, however, had arisen a somewhat amusing circumstance in connexion with the Exeter Corporation and the gas company. The corporation had long had a longing eye towards the company's works, and they appointed a committee to negotiate with the company for the purchase of their works. For a considerable time the gas company at Exeter had been subjected to prosecutions for nuisances, &c.; and it was a peculiar fact, often accompanying circumstances of this kind, that when an endeavour was made, or a wish expressed, to obtain possession of certain property, an effort was first made to depreciate the value of it. Whether these prosecutions arose out of that wish by the corporation, of course, he could not say; but it was a fact. Well, the committee were appointed in May, and opened negotiations for the purchase of the works. These negotiations, however, did not appear to have progressed satisfactorily or smoothly; but while the committee on one occasion were sitting in deliberation, a flash from the electric candle broke in upon their reveries, and threw an altogether new light apparently on their views. A council meeting was called, and held on the 27th of June last, and it was resolved, after a very long and elaborate discussion, to rescind the former resolutions, and abandon the idea of purchasing the gas-works. It was further decided that means should be taken to compare the new kind of light with gas. He (the chairman) did not know whether that was in store for the Devonport Company; if so, they must be prepared to meet it. He had no doubt that the electric candle might be brought to produce a steady light, and then competition would begin.

The adoption of the report was seconded by Mr. Colwill, and carried without dissent.

The dividend, as recommended, was agreed to. Messrs. Honey and Oram were re-elected directors. Mr. Bearblock was elected auditor with Mr. W. Mogg, in place of Mr. Rickard (deceased), and the salary of the auditors was increased to ten guineas each per annum.

The Chairman, in reply to a vote of thanks to the directors, said they had decided to reduce the amount charged to the corporation for supplying the street lamps by 4s. per lamp per annum, thus making a reduction of 8s. on the contract price. This would make a difference to the borough of about £160 a year. In answer to a shareholder, he stated that the object of a reserve-fund was palpable. So far they had got on very well without accident, but in such works as theirs there was no knowing what might occur at any time, and it was as well to be prepared for any mishap.

ACCIDENT AT THE DEVONPORT GAS-WORKS.

A very extraordinary and serious accident occurred at the Devonport Gas-Works on Tuesday last. For some time it threw the immediate neighbourhood into a state of consternation, and greatly interfered with the lighting of the town for two or three nights. Within about 50 yards of the gasholders on the works, excavations are taking place, under contract with Mr. Wilcocks, of Plymouth, for the erection of a new tank, which, when completed, will make the fourth in the possession of the company. These excavations, alike from the size of the new holder and from the nature of the ground worked upon, were extensive and difficult, and in order to remove the rock, blasting operations became necessary. The three gasholders in use by the company are within 50 yards of these works, and it will be easily understood that, in the absence of full and complete precautions, the labour of blasting in such proximity would be attended with considerable danger. Nor was this danger altogether unanticipated, and we understand that the manager of the company having perceived it and reported it, the chairman communicated with the contractor on the point. This fact is now likely to assume some importance. Be this as it may, between two and three o'clock on the afternoon of Tuesday, and while every person on the works was in a condition of perfect confidence, a violent explosion was heard, and the next moment the entire works and neighbourhood were enveloped in fire, which was followed by dense volumes of smoke. As may be imagined, surprise and alarm seized every one near the place; the workmen hurried to and fro in consternation, and the inhabitants of the houses surrounding the gas-works—the locality being thickly populated—rushed out in great affright. It was speedily discovered that one of the gasholders—in fact, the largest of the three—was on fire. As soon as the smoke cleared off—the manager being fortunately present upon the spot—an inquiry was made into the cause of the explosion, and the result was found to be as follows:—The blasting operations adjacent had been in progress that afternoon, and it is supposed that a large piece of stone was blown over the separating walls, and fell on the top of the gasholder, immediately penetrating it. The immense volume of gas in the holder spread to the fires in an adjacent retort-house, there igniting. The flame of fire is stated to have ascended to a great height, and to have illuminated the whole place as if it were enveloped in lightning. The holder is made of sheet iron, and is at least 60 feet in diameter, and the plates on the top were twisted and buckled up by the force of the heat as if made of brown paper. The violence of the shock, too, threw the holder out of gear, and the rapidity with which it fell as the gas was exhausted, brought down part of the iron framework with great force. It was particularly in this respect that there was danger of the accident being attended with serious consequences, and a remarkable escape was experienced. The other two holders are within a few feet of the one in question, and at the time of the explosion one was empty and the other was nearly full. Happily the iron girders which fell, descended partially upon the former, making a hole many inches in diameter. Had they fallen a few feet in the other direction, upon the full holder, the consequences would have been very much more serious, and the public of Devonport would have been without gas for many days. As it was, however, this was the only holder available, but a certain portion of gas could be made and rendered serviceable. Bills were published as soon as possible, apprising the public of the accident, and asking their forbearance with a limited supply of gas under the circumstances. Only one in four of the public lamps was lighted, but fortunately the night was a fine one, and the moon came out most kindly and opportunely on the occasion. Considering the whole of the circumstances of the accident, it seems providential that no life was lost or injury inflicted either to person or property. The only effect in this respect that has come to our knowledge is that a portion of the crops of the kitchen gardens on one side of the works was scorched, and that two or three pigs that were roaming about near in grunting happiness had their backs uncomfortably scorched. The damage done to the works is, at least, £500, and it will take some weeks to repair. The public of Devonport, therefore, will have to endure only a partial supply of gas for some days yet. As soon as possible assistance was procured to rectify the injury done, and men have been engaged day and night to do so without delay. We understand that there are clauses in the contract taken by Mr. Wilcocks protecting the company against any loss by damage in carrying on his works, and if this be so the accident may fall heavily on the contractor in a pecuniary sense. It will also be a point for investigation how the blasting could have occasioned the accident, because it is the opinion of those who are competent to judge that, had the precaution been carefully taken of laying mats or chain-link over the blast-holes, the *débris* could not possibly have been thrown into the air by the explosion. We should not omit to state, also, that when the holder descended so rapidly, on the exhaustion of the gas, the water beneath was sent over the barriers in great force, flooding the ground around for some distance.

It is a strange circumstance that that very morning the company held their 37th annual meeting, which was one of the most gratifying that had been held for several years. Indeed, the shareholders had not dispersed more than a couple of hours, and the chairman, during the proceedings, congratulated the company on their condition; but, curiously enough, in announcing that a larger amount than usual had been carried to the reserve-fund, made the remark that it was well to be prepared for casualties when they occurred.

The most absurd stories were propagated in the town concerning the accident. One person declared that the houses at Ford were perceptibly shaken; another averred that his house in a terrace near shook as if rocked by an earthquake; while another gentleman—a colonel, too—stated that he heard the explosion at Weston Mills, three miles away, and saw the gasholder blown hundreds of feet up in the air! The fact was that the explosion was comparatively slight, and that the gasholder itself was not lifted a yard, for, as the gas expended itself, it at once descended, though, as stated, violently, into its socket. The rush of the gas and fire created much noise, and what was thought to be the explosion was really the crash of the iron framework on the ground, and particularly on the empty gasholder.—*Devonport Independent.*

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from page* 144.)

Mr. JOHN REID (Edinburgh) read the following paper on

A MECHANICAL DIFFICULTY WITH COAL TAR, AND METHOD OF SURMOUNTING IT.

Early last year my company leased the tar and liquids produced at their works for a period of years to Mr. Ross, manufacturing chemist, Falkirk, and undertook to pump the tar from the tar-well in their works into a cistern overhead, elevated 45 feet above the ground; and the lessee undertook to accept delivery from the said cistern, and remove it daily by railway tank-waggons.

As no convenient loading-bank could be had near the works, accommodation was obtained on the Portobello branch of the North British Railway Company at fully one-quarter of a mile eastward from the gas-works, where cisterns containing 50,000 gallons are erected on a platform high enough to allow their contents to flow into the waggons when brought alongside.

The pump-cistern at the gas-works communicates with the storing cisterns by means of a 6-inch pipe, having its discharging end lower by 15 feet than the feeding end at the gas-works, and giving a head pressure of 15 feet at the delivery end into the storing cisterns. But, in consequence of intervening obstacles, the connecting-pipe, instead of having a uniform declination from the one cistern to the other, had to be laid in the manner of an inverted syphon, of which 1200 feet of its length is embedded in the earth 4 to 5 feet deep under the railway, turning upwards, by vertical pipes at each end, to the feeding and receiving cisterns respectively.

Having some apprehension from the first that trouble would arise in the event of a temporary stoppage of the stream in the pipe, whereby the confined tar might cool and lose fluidity, as tar from cannel coals will do from cold, only a few weeks elapsed until this really occurred. The engine-pump having stopped for a few hours for repairs, it was found that the head pressure of 15 feet was quite ineffectual in restoring the discharge at the distant end, and several hours were employed in expedients before it could be again induced to move on. Of course, the best preventive of a recurrence of this interruption in future was to have a supplementary pump to work by hand, and keep the current in motion. This was at once provided, and has been once or twice in requisition, and serves the purpose efficiently.

But in the course of the autumn it was observed that repeated daily interruptions in the flow occurred, continuing for longer or shorter periods, and occasioned by the circumstance that the same tar-pump is employed all the year through; and while it is large enough in capacity to pump more than is produced in the middle of winter, it is too large by three or four times than is necessary in the summer months. And it so happened that several times daily the flow of tar suddenly stopped from the well becoming empty, and the large mouth of the suction-pipe becoming unsealed, and the tail-pipe filled with air.

When this occurred, and owing to the great surface area of the tar-well, sometimes more than an hour elapsed before the pump got disentangled from the volume of air filling the tail-pipe, and began again to lift the tar.

Feeling that even half an hour's stagnation might in cold weather lead to the greatest inconvenience and danger, and the speed of the engine driving the pump had to be kept up for other important purposes, the evil could not be met in that way. And it was obvious that the perfect remedy lay in devising, if possible, some method whereby the quantity of tar raised by the pump should be made to coincide exactly with the quantity and rate at which the tar is deposited in the well.

Thinking this matter worth explaining to the Association, I shall now describe the very simple but effective contrivance I have found to solve the difficulty.

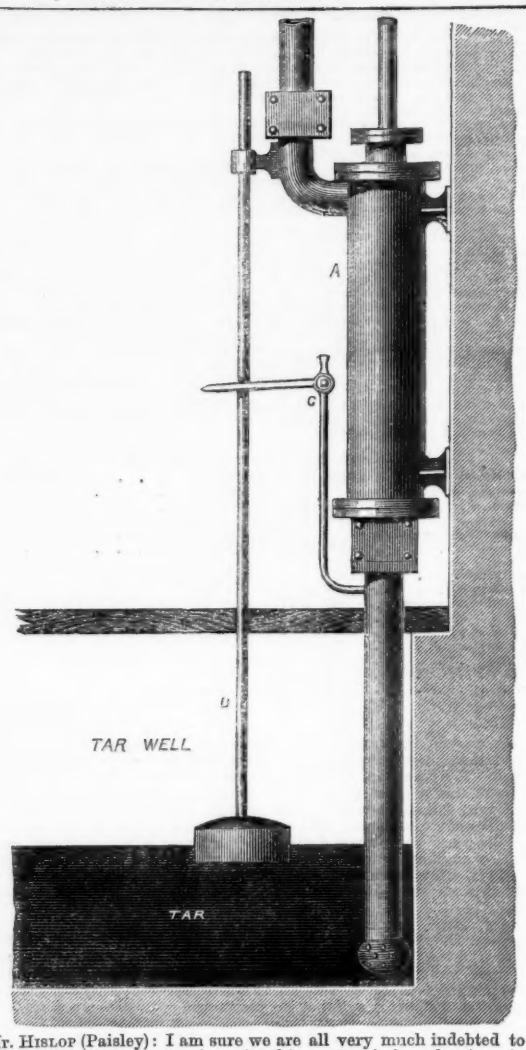
Every engineer knows what happens to any pumping apparatus if a hole should break out in the suction or tail pipe. In the proportion that any such hole admits air into the tail-pipe by each stroke of the pump, in the same proportion is the volume of liquid raised by each stroke diminished.

Taking advantage of this fact, I provided an artificial air-hole to the tail-pipe of the tar-pump. This air-hole possessing the self-acting property of adjusting the size of its orifice, so as to admit the precise quantity of air that will compel the pump, at whatever speed, to continue pumping and maintaining the flow unbroken, and at the same time constrain it to draw the tar only *as fast as*, but *no faster than* it runs into the well.

The accompanying sketch exhibits the apparatus by which all apprehension and danger have been got rid of. A, tar-pump; B, float in well with stem above; C, air-cock opened, shut, or regulated by the rising or falling of B.

The level of the tar in the well having been fixed at about one-third of its contents, never varies in depth more than from 1 to 2 inches. The float and stem B rising or falling with the slight changes in the tar level, correspondingly opens or closes by means of a small lever, the orifice of the air-cock, C, and thereby regulates the volume of air admitted by it into the tail-pipe. The air-cock contrivance, while never allowing the pump to lose its *fang*, has in every way the whip hand of the pump, A, which it never allows to draw more nor less per stroke than the volume of tar that is for the time being deposited in the well. This it has continued to do uninterruptedly day and night during the last nine months, and has required no looking after whatever.

I may just mention that, after devising and applying this method, I thought I had solved the difficulty by a rather roundabout way. Would it not have answered the same purpose to have made a slit in the suction-pipe, to admit the necessary air without any float to open the stopcock? That would have the same effect, but it does not fulfil the whole duty performed by this arrangement. This cock may be put out of action at any time, and leave the pump entirely dry.



Mr. HISLOP (Paisley): I am sure we are all very much indebted to our friend, Mr. Reid, for having brought this matter before the Association. I think the arrangement he has shown is certainly a good one. Had the air opening been made in the descending pipe it would have left a portion of the thick tar always in the bottom of the well, while by this arrangement he is able to draw from the bottom pipe, and the denser portions of the tar may be pumped. It is altogether a very simple arrangement, and seems to me to answer the purpose most efficiently.

Mr. HALL (St. Andrew's): I suppose it was the air accumulating in the empty pipe that caused the stoppage?

Mr. REID: Yes.

Mr. HALL: I have no experience in that subject with tar, but I know a similar difficulty occurs with water in like circumstances. When the pipes supplying mansions are not attended to, the air gets into them and stops the flow of water, and the way to get rid of this is to erect a standpipe at the highest point, which allows the air to escape.

Mr. REID: The object aimed at was to maintain in the long pipe, which lay in the ground, a constant flow or current—not to allow that current to be suspended even for half an hour. This pump takes up the tar just as it is made, and I believe since it was put on, in the beginning of October, the stream at the delivery end has not been seen to stop for a single instant. It keeps the pipe constantly warm, so that the tar cannot get cool and solidify.

Mr. PEEBLES (Edinburgh): I think this is a most admirable arrangement, and is exactly fitted for its purpose. It goes away down in the form of a syphon, and maintains an action in the level pipe exactly the same as if it were a pipe on a small incline. The tar is taken away in very small quantities, instead of accumulating in the well, and there is a continual flow of tar at the minimum rate. I have great pleasure in saying that this is an admirable arrangement to obviate the stoppage of the flow of tar.

Mr. SMITH (Aberdeen): The same object would be gained by returning the tar through the delivery-pipe when the float fell a certain distance to open the stopcock.

The PRESIDENT: You would not have a constant flow by that means.

Mr. REID: The object is to convey along the pipe a constant stream of heat, and keep the tar in a liquid state.

Mr. SMITH: When the pump was throwing a certain quantity, if the float fell in the well, thereby opening the stopcock, the tar would be returned back into the suction-pipe.

The PRESIDENT: There is an upright pipe at each end, and a level pipe between, and in this level Mr. Reid wishes to maintain a constant current. The plan you suggest would prevent the air getting into the suction-pipe, but would not keep up the current.

Mr. ROBB (Haddington): Is the air drawn in; and how does it affect it?

Mr. REID: Suppose the area of the well is extensive, the tar cools at the mouth of the pipe, and, during the action of the pump, suddenly breaks away, or unseals, leaving a considerable gap, and it takes a long time before you can again seal the tail-pipe. We had a stoppage for some time in consequence of the thickening of the tar.

Mr. WHIMSTER (Perth): If Mr. Reid was to make the suspending wire, on which his float is hung, a tube, so that it would rise and fall with the well, and shut and open the cock, would he not prevent air getting into the pipes? He would simply pump the tar, and what was not wanted would return through the tube and be pumped over again.

Mr. HALL: Since the difficulty is keeping the air out of the pipes, I suppose Mr. Reid wishes to prevent the tar from cooling and unsealing the tail-pipe.

Mr. REID: The pump throws up the tar into an open cistern, and all the air escapes. There is not a particle of air gets into the pipe at all.

The PRESIDENT: I think the explanation Mr. Reid has given will satisfy all that this apparatus is well designed to overcome the difficulty he met with. It is only by gentlemen coming here and explaining how difficulties arose with them and were met that we are enabled to overcome them, and I am sure the members of the Association are very much indebted to Mr. Reid for bringing forward this matter.

Mr. ROBERT MITCHELL (Coatbridge) read the following paper on

THE CONDENSATION AND TREATMENT OF GASES BY THE AITKEN-YOUNG PROCESS.

Two months ago I was favoured with a visit of your honorary secretary and Mr. Myers, of Broughty Ferry. The new process of treating gases under condensation was talked over, and I was asked to prepare a short paper on that subject. At that time I declined, thinking that some other member would come forward, who had been lately more immediately connected with the process. No one coming forward, however, and being again asked, I felt it my duty, as a member of the Association, to lay before you what little I know of the subject.

It must be apparent to every observer, the improvements which have been made in the various branches of industry within the last few years; still the process of gas-making, as carried on in our moderately sized works —in fact, nearly all—is just the stereotype of what was in use 20 years ago. There have been a number of minor improvements, but virtually it is the same method of carbonization and condensation as at the period referred to.

The process to which I purpose drawing your attention has been before me for a considerable time. I had the privilege of being an assistant to Mr. Young during the whole time this process was being carried through its various stages, until it reached the success which it now has attained. During the whole of that period the laboratory and all the apparatus were open to me. All the experiments and analyses were most carefully gone into and noted, with all the particulars which marked their progress; on the understanding, of course, that at that time all my observations were strictly confidential.

Our general aim in carbonizing coal is to conduct the distillation at such a temperature as will produce the greatest volume of gas capable of giving the greatest amount of light. To arrive at this, care must be taken that the coal is not subjected to too high a temperature, in which case the constituents of the coal are over-decomposed, and converted into the denser hydrocarbons, marsh gas, &c., giving when consumed a very low illuminating power.

On the other hand, when the distillation has *not* been carried on at a sufficiently high temperature, the constituents of the coal are *not* sufficiently decomposed; hence the large quantity of liquid hydrocarbons formed, a large portion of which is capable of being permanently diffused through the gas, and which would improve, to a very considerable extent, the illuminating power. But owing to the coal being so distilled, and the gaseous products being so small in volume, they are only able to absorb a very small proportion of the total liquid hydrocarbons; hence, at low heats, the total sperm value is small.

You will also observe that the gas produced at a high temperature, and which has undergone excessive decomposition, and formed these denser hydrocarbons, will absorb from the gas any portion of the lighter hydrocarbons which may have escaped decomposition, unless certain precautions are taken during its condensation. One of these is the keeping of the tars in a heated state, thus negativing the affinity of the tar for the volatile hydrocarbons, and causing the gases to pass away, holding in diffusion a considerable amount of the hydrocarbon vapours which, in the usual method of condensation, would be found in the tar; thus showing that the tar has an affinity for, and also a solvent action on, hydrocarbon vapours suspended in the gas.

It is, I presume, an undisputed fact that the luminosity of the gas is, to a large extent, due to the presence of the volatile hydrocarbon vapours, and which may be determined by a very simple experiment. I have here three jets. No. 1 is for the purpose of consuming the gas as supplied by our friend Mr. Watson. No. 2, as you will observe, is connected to the top of a Woolfe's bottle, in which is contained a dead oil. No. 3 is attached to a similar bottle, in which is contained a quantity of very volatile hydrocarbon fluid. You observe that No. 1 presents a flame, the luminosity of which is all that could be desired. No. 2 is so far reduced that I fear a few members in the back of the hall will be unable to see it. In No. 3, by presenting the gas which has been robbed of nearly all the light-giving constituents by passing through No. 2, we have a flame highly luminous, showing conclusively that the increased illuminating power is due to the presence of the volatile hydrocarbons suspended in the gas.

After having thus demonstrated that the illuminating power is in proportion to the presence and constitution of these vapours, a question very naturally suggests itself—How can we retain, or what process can be brought into operation so as to suspend or allow the gases to carry in diffusion, and permanently preserve, these vapours, so valuable for light-giving, instead of allowing them to be sold in the tar at a merely nominal rate?

The process, as patented by Messrs. Aitken and Young, and known as the Analyzer Process, meets this in a most successful manner. This piece of apparatus consists of a large vertical chamber, into which are fixed tray diaphragms, placed and arranged so that the gases passing through it have to go alternately from side to centre of these trays, each tray being so formed as to contain about two inches of the hydrocarbon liquid. The centre apertures are supplied with wire-gauze tubes, which dip into the diaphragm under it, so that all the gases passing have to come in contact with the liquid on each of these trays. The bottom of the apparatus is fitted up either jacketed or supplied with a steam coil, which serves to keep the tars heated up to a sufficiently high temperature (say 225°), or sufficient to volatilize the light hydrocarbons they contain. The gas and tar pass into the analyzer by the same pipe. The gases at this point are carrying in diffusion tarry matter. The volatile hydrocarbons thrown off by the partial distillation of the tar have an affinity for, or, in other words, the power of uniting with, these tarry particles, and separating as they pass through the first wire-gauze tube, which is suspended from the second tray.

As I have already stated, these trays are so constructed as to contain over their whole area about two inches of the hydrocarbon liquid. When these get overloaded, the liquid falls into the tray below it, and so on until a portion of it reaches the bottom, where it is either revolatilized or run to the well. The gases at this stage, still carrying a small portion of the tarry matter, are subjected to a series of washings with this distillate, and as they ascend through the various tray diaphragms they deposit the heavier hydrocarbons, still carrying in diffusion and absorbing a quantity of the more volatile ones from the remaining trays, the quantity of which shall be in proportion to the quality of the bituminious material carbonized, and the manner in which the carbonization has been conducted. As nearly all the tarry matter has been left in the analyzer, the gases flow on to the scrubber at a temperature of somewhere about 75° Fahr., thence to the purifiers, where the advantages of the process are not less remarkable.

Having given a general outline of the apparatus and its mode of working, I will confine my further remarks to the advantages, or the applicability, of this process in the manufacture of gas having a high illuminating power.

You are all thoroughly conversant with the advantages to be derived from the use of some inferior gas-producing material, along with those high-class cannel coals of ours, which, if distilled alone, the gases would be able to convey to the point of combustion only a small portion of the hydrocarbons formed, whereas by the employing of a material producing gas of a comparatively low illuminating power, but giving a large volume, we secure what serves as a medium for carrying in suspension those surplus vapours produced from the rich coal, and retain them in a permanently gaseous state to the point of combustion; hence the sperm value by so mixing is increased. Now, gentlemen, I consider that one of the great advantages of this process is, that all the hydrocarbons suitable for diffusing through a gas and adding to its illuminating power are perfectly utilized. From the nature of the process, should there be a surplus of hydrocarbons in the gas, at any particular stage of the distillation, they are condensed and left behind in the upper trays of the analyzer, in the manner I have already indicated, and they are there stored ready to carburet any poor gas which may be presented to them. Indeed, the experiments, in which I more particularly assisted Mr. Young, perfectly convinced me of the advantages of this process.

Those experiments consisted of an adaptation of what you all know as the hydrocarbon process, which I had previously looked upon as impracticable, owing to the difficulty of producing a gas of uniform quality; that quality being entirely dependent on the skill of the operator, from the necessity there was in blending the water gas (hydrogen and carbonic oxide) with the hydrocarbon gas, in exact proportions, so that he might take the surplus hydrocarbons produced from the bituminous material employed during the process of carbonization. When the water gas (hydrogen and carbonic oxide) was passed in too small a quantity, the hydrocarbons, instead of being taken up, were deposited, run to the tar-well, and lost. On the other hand, when the water gas (hydrogen and carbonic oxide) was in excess, the hydrocarbon gas was diluted, and thereby deteriorated in its illuminating power. Therefore it can be easily observed it would be difficult to regulate the proportions.

By this new process the difficulty just indicated, in my opinion, is very much modified, if not entirely overcome, for it is not necessary that the gases be generated and blended simultaneously in the proper proportions. Should there be a deficiency of the water gas, the surplus hydrocarbons are deposited in the analyzer, and there stored up to carburet the water gas (hydrogen and carbonic oxide) when a superabundance is added. All that is necessary is to make sure that the quantities necessary for giving a certain quality are produced.

An instance of one of the experiments made will illustrate more fully my meaning.

One of the shales employed in the experiments gave us a yield of 6269 cubic feet of 38-candle gas by the ordinary process. When a charge of this shale was passed through the analyzer, the surplus hydrocarbons were there condensed and deposited. The gas from a charge of a common splint coal, yielding 8500 cubic feet of 17-candle gas, was then passed through the analyzer; the illuminating power was increased to 25 candles, thus showing that had those two materials been distilled separately and mixed, there would have been produced 14,769 cubic feet of 25·91-candle gas, whereas by employing the hydrocarbons from the rich shale there was produced the same quantity of gas, but having the very superior illuminating power of 30·52 candles.

If we wish to have a gas from those materials of 30·52 candles, all that we have to do is to work them in equal proportions, when the analyzer will secure that the whole of the volatile hydrocarbons are diffused through the poor gas, whether they be worked together or not.

Again, this same shale, on being distilled and passed through the analyzer, the surplus hydrocarbons deposited there, steam then admitted into the retort, and there decomposed by the fixed carbon, until the total bulk of the gases were brought up to 10,000 cubic feet, it had an illuminating power of 35·38 candles.

It is thus shown conclusively that the analyzer is capable of fully utilizing the hydrocarbon vapours resulting from the distillation of a rich bituminous substance to carburet water gas (hydrogen and carbonic oxide). In conducting the hydrocarbon process by means of the analyzer, with a given bituminous material to produce a given quality of gas, all that is necessary is to see that from a given quantity of said material a given volume of gas is produced.

Of course, I am aware that in this country, where coal can be had so cheaply, it is not likely the hydrocarbon process will be employed, unless, as Mr. Spice very justly puts it, a coal famine was again to come upon us, In such a contingency, I have no doubt he is quite correct in asserting that his process of manufacturing hydrogen gas in conjunction with this analyzing process would be extensively employed.

My sole object in making reference to water gas is to show the utility of this new analyzing process in storing up and applying the surplus hydrocarbons from a rich gas to carburet a poor one, or from one stage of the distillation to that of another. I have every confidence in laying this process before you, as I am satisfied it is a great step in the right direction. And I hope that any little information I have been able to contribute may tend to direct your attention to the subject, so that, by discussing the matter, we may be enabled to judge of the practical utility of the invention.

Mr. SMITH: Why is the steam put at the top of the apparatus? Does it not touch the gas?

Mr. MITCHELL: The steam never touches the gas; it is only for the purpose of keeping the trays hot.

Mr. WHEMSTER: Is there any chance of the wire gauze choking up?

Mr. MITCHELL: It is almost an impossibility.

Mr. PEEBLES: What size is the mesh of the gauze?

Mr. MITCHELL: A quarter of an inch.

Mr. YOUNG (Clippens): The size is eight meshes to the inch, made of No. 18 or 20 wire. We find that, although the apparatus keeps perfectly clear for about three months, it is sometimes necessary to put a little steam into the uprights, so as to float the tars off. I believe, in working the arrangement, it would be better to put in a rougher mesh at the bottom, and finer meshes as we ascend. The object of having three trays is to present a much larger surface, and they do not require so much heat. At Hamilton there was one jacketed tray, and we were very much disappointed to find that the jacket was not tight, so there was a steam coil put in, which was found to answer the purpose admirably. Without trays, any other arrangement by which the tars are kept above the condensing points of the hydrocarbons will give the result, the sole object being to combine the tar-distilling and gas-condensing arrangements in one, so that the tar will be deprived of naphtha, and the gas deprived of tar, which alone will go away into the tar-well.

Mr. ROBB: There is one point I should like some information upon. I am exceedingly pleased with the apparatus, which seems to me to be per-

fectly true in theory, and almost perfect in practice; but before adapting it to works where the annual consumption is large enough to warrant its introduction, I would like to hear something of the real value of the ordinary cannel coal in using this apparatus. It is stated in Mr. Mitchell's paper that the illuminating power added to the gas, using ordinary second-class coal, is four candles. The Camps coal was used at Hamilton; but it is said to be a superior coal, which anybody, by the ordinary method of working, could make equal to 24 candles, or even 38 candles, with a quarter of Westwood shale used along with the coal. Would it not be advisable to make gas equal to 28, or even 29, candles with one-quarter Westwood shale and three-quarters Camps cannel?

Mr. FAIRWEATHER (Barrhead): With regard to Camp coal, I mentioned the matter to the West of Scotland Association, and Mr. Dunlop, being present, said he was quite convinced that the report was over what it should have been, and that the actual illuminating power of the coal was only between 22 and 23 candles.

Mr. ROBB: 23·9 is in the analysis.

Mr. SMITH: I have been watching this apparatus with very great interest. I suppose I am placed the farthest from the coals, with the exception of a few, and anything that can raise the illuminating power of the gas I try to watch, and do everything in my power to adopt it. I must confess that I fail entirely to see in what way this apparatus can raise the illuminating power of the gas three candles, because, by the ordinary process, we are making 28-candle gas, and carbonizing the coal on the most approved principle. If we take the tar from the well, and turn it into gas again, we can get nothing more than 12-candle gas, and how can this tar be turned into 30-candle gas? That is a question I should like answered, as there may be something in the chemistry of the process which gives this result. Another question I would like to ask is—What deterioration is there in the value of the tar, estimating it to be worth so much per ton of coals, after condensing by means of this apparatus?

Mr. STEWART (Greenock): I have myself tested this apparatus, and I have no doubt it would be of great advantage to gas-works, as you get by it all the advantages I get by distilling the tars. I get as much for boiled tars as tars which are not boiled.

Mr. SMITH: I hope Mr. Mitchell will bear in mind the question I asked. I want to know the value of the products after using this apparatus, and how you can raise the illuminating power of the gas. I read over the West of Scotland Association's report of the process, and one thing struck me on looking over the *data*—namely, that one of the experiments did not bear out the others. I refer to the condensation by bromine. By the ordinary process the result is the same in all cases, and the condensation by bromine should have gone up like the others.

Mr. YOUNG: I have here a sample of hydrocarbon from which, by passing the gas through it, I can bring the illuminating power up to 80 candles, which is equivalent to 5 cubic feet. By passing it through a retort it would produce 50-candle gas. Here we have got all the atoms of the naphthas and tars shrunk up—in other words, the specific gravity of the vapours is something like from four to six times the specific gravity of the gas itself. It very much depends on the quantity of naphtha in the gas what the illuminating power is. Dr. Letheby, of London, made a long series of experiments, and he found that a single grain of naphtha increased the illuminating power by 10 per cent. Here we have our coal tars taking away, not the most volatile portions of the hydrocarbons, but the very densest portions. Perhaps this will also account for the low condensation from bromine. We know if we take the condensed matter and analyze it, we find its constitution is something like that of benzole, and if we condense the matter from the Newcastle coal, we find that 4 per cent. of condensation represents 12 candles, while 4 per cent. of Boghead coal represents 20 candles. We can easily understand that, seeing the gases have taken up and hold in suspension all the more volatile portion of the matter, they will receive more illuminating power by the condensation of the denser portion. If we could only find the means of getting gas with all its carbon, we should have a very high illuminating power, but seeing we require to put it through a retort, we lose some of this power. As to the relative value of the products, that is a thing only time and the market will decide. The whole you do with the tars is simply to take away the naphtha, and two-fifths of the whole tar made in Great Britain is sold as boiled tar. Whatever the product, you will be the gainer, because if you do not get the value of the hydrocarbons in your gas, you will get it in the products you sell.

Mr. STEWART explained that, with regard to the price of boiled tars, he had the greater part of the world as a market to sell it in.

Mr. WHIMSTER: I would like, if we could, to get at the exact results that have been realized from this process per ton of coal. If the coal is carbonized, and the tar resulting from it is treated in this apparatus, how much illuminating power will it add to the gas, and what increase in quantity will there be, taking any coal you like?

Mr. REID: To my mind, another question is also of importance. What is the effect of the absorption of these liquid hydrocarbons in regard to temperature? Suppose these gases were in a gasholder, and exposed to severe temperature, what would be the result?

Mr. WHIMSTER: I understand this gas is permanent gas, and I put my question on that understanding.

Mr. SCOTT (Musselburgh): Will it be stated, in plain words, what would really be the advantage of this apparatus in regard to the quantity and quality of gas from a fair coal?

Mr. PEEBLES: I still think Mr. Smith's question, as to the deterioration of the present value of the tar, should get a distinct answer. I am quite certain, from the open and above-board way in which everything in connexion with this process has been gone into by the patentees, that they are willing to give every information in their power.

Mr. WHIMSTER: Might I say that the volatile naphthas derivable from coal tar in the ordinary process are worth 2s. 4¼d. per ton of coal, and that the result in tar is better than the tar would be from this process, in my opinion. If the naphtha of an ordinary tar, obtained by the ordinary process, can realize a clear profit, and we have residual products equal to what you have, is not that some advantage?

Mr. ROBB: If it were stated what is the per centage of loss in naphthas and hydrocarbons in the tars, from any ordinary coal we are in the habit of working, we could calculate the loss to us who depend for the sale of our tars on the proportion of naphtha.

Mr. MITCHELL: I do not see where Mr. Whimster can get his 2s. 4¼d. per ton of profit, because, taking Dr. Letheby as an authority, an English coal, which yields half the quantity of Scotch, gives one-third of crude naphtha per ton. I had no intention of touching on the experiments conducted at Hamilton; I merely took up the subject on its merits. If this Association has any wish to go into experiments to answer these questions, I have no doubt the patentees will only be too glad to co-operate in the matter.

Mr. YOUNG: It is quite natural to suppose, seeing that we have to pump hydrocarbons from the drip-boxes, that we are all agreed as to their value. Our present mode of condensation is a very crude one. We separate the benzole from coal tar by one or two, or more, operations, to fractionize the matter, while there should be a series of condensations, and hence the reason why the hydrocarbons are not properly fractionated, and the naphtha in the tar is not fractionated. By this process the tarry particles are sifted out, the analyzer arrangement having a fly-wheel action. The present method is simply to condense the tars from our gases and run them to the tar-well; there is no fractionating process. I have no doubt that from a rich coal 2s. 4¼d. worth of naphtha per ton can be got. One single grain of naphtha, added to a cubic foot of gas, increases the illuminating power 10 per cent., and the naphthas are worth three times what they realize separately when they are diffused through the gas. Here the whole process of condensation and fractionating is conducted in one single operation, and if it is good to put so much hydrocarbon in our gas, why should we not put in more? It is surely more profitable to diffuse hydrocarbons through gas than to sell them in separate naphthas.

Mr. WHIMSTER: I quite agree that this is the best process of utilizing the volatile portions of tar. It is not a new idea (and I think it is one in the right direction) that we ought to aim at any fractional distillation of secondary products. Nay, further, it is absolutely necessary to get our gas to carry away all it can. What I want to know is, will it benefit me to turn from the process of tar distillation to this process with its secondary products? I say, with my heats and rich coal, we aim at producing gas equal to 27 candles. What results have been realized from the working of this process—what definite results? what increase of illuminating power? what increase in quantity? I say we can get tar from a ton of coal by the ordinary process, yielding six gallons of naphtha of about 885° to 890° specific gravity, and from that we can get at the rate of 2s. 4¼d. per ton of coal, after clearing the expenses of the process, and we have besides the tar boiled ready for the market, and all the ammonia in the tar separated from it; so that I hold that our tar is better than that produced by this process, and is as great in quantity. Will it benefit me anything to turn from the present process and adopt this one? We are practical men, and do not cavil at inventions; we are inventors ourselves, and are very glad to see inventions brought out, and we praise and forward them. I am just as ready as any one to give all the praise that is due to the patentees of this process, which seems beautifully adapted for the object it has in view; but what is the benefit of it to us as gas managers?

Mr. MONK (Lanark): Do I understand Mr. Whimster to say that six gallons of naphtha are got from a ton of coal?

Mr. WHIMSTER: It is 1·6 gallon. I am sorry I left my book with the calculations at home, but any one who wishes can see them.

Mr. BLAIR (East Wemyss): In taking a ton of coal, and taking the product from it, what is the weight of the tar, the weight of the water and the coal, and if there is an increase of illuminating power, how much is it?

The PRESIDENT: I scarcely understand your question.

Mr. YOUNG: I think he means to ask whether there is any change in weight. That has not been proved yet; but I expect there will be no change, for the simple reason that this process does nothing but fractionate the tar; it simply divides the naphthas from the tars in the process of condensation. Instead of having the weight of the naphthas in the tars, you have it in the gas. The ammoniacal water is exactly the same, and the ammonia is also the same.

Mr. REID: In short, nothing is annihilated.

Mr. MONK: Whether is it better to put the naphtha into the gas or drive it away?

Mr. MITCHELL (Dundee): The meeting can only judge of the merits of this process if there are some practical details given to show in the ordinary working that an ordinary coal produces a certain quantity of gas of a certain quality. If Mr. Mitchell had been able to show what this ordidary plan of ours would turn out if this analyzing process were adopted, we would have been in a better position to give an opinion. At present we take up a certain quantity of gas, and leave a certain quantity of naphtha—about two-thirds of a gallon per ton of coal—and if it could be shown practically what the result would be in quantity and quality by this new process, taking such coal as we use at present, it would be more satisfactory.

Mr. SMITH: I do not think the patentees can show they can get more gas by their process; the only thing they claim to do is to raise the quality of the gas.

Mr. YOUNG: Supposing the coal was equal to 10,000 cubic feet of gas, 9·8 grains of naphtha for every cubic foot at 5 per cent. per grain, would be 50 per cent. of increased illuminating power, were it possible to use the whole of the naphtha. If you want to economize the hydrocarbon, it is essential to employ some poor coal to use up the surplus of naphtha. It is quite evident that from poor coal you will not get the same quantity of naphtha as from a rich coal, but if all the naphthas were diffused through the gas it would add 50 per cent. to the illuminating power. Dr. Wallace admits that at Hamilton there was 1·7 per cent. of such a naphtha in the product, but that was evidently unsuited to diffuse through the gas we were making. To utilize your naphtha vapours you require to use poor coal. I have not the least doubt that the further this matter is investigated you will be the more convinced that every grain of naphtha you employ in your gas is worth three times more per ton of coal than by selling it separately. Dr. Letheby points out that there is an increase of illuminating power to the extent of 4 per cent. for every grain of naphtha, and in many cases of 10 per cent. It was asked whether there would not be a danger from condensation taking place in the gasholder in a low temperature. Seeing that not only do the denser vapours get away, but carry down a great many of the lighter ones, I think any gentleman may safely make the experiment, keeping the tars long enough in contact with the gas at a temperature sufficiently high to take away the volatile vapours.

Mr. MONK: In drawing up the report of the West of Scotland Association, we anticipated all these questions, and have given there the value of the naphthas, and the per centage of naphtha in the tars in each process, and also the temperatures and the balance of sperm per ton, so that each man may calculate the value of this process, and whether it is best to convert the naphtha into gas or sell it as naphtha. I look upon the process as the perfection of the condensation of illuminating gas, and I speak from general observation, both in Europe and America. In reference to Mr. Robb's remarks as to the analysis of cannel coal, we did not take that coal for analysis; we took the coal that was lying at hand. In the reports appearing in the JOURNAL OF GAS LIGHTING of the 15th of May, we gave the products of the whole. We took the coal as it was lying, and put so much of it through the retorts in the ordinary process, and so much through this apparatus. The heats were about the same—about 1800° or 2000°, a good white heat at the back of the retort, and not so hot in front. I think these comparative results are far more reliable than those obtained from analysis. This question has been put and answered before. I would refer to a letter which appeared in the JOURNAL of this week from Mr. Key.

The PRESIDENT: As Mr. Key is not here to defend himself, I think you should not refer to his letter.

Mr. HALL: This discussion has certainly gone on for a great length of time; but I have one point more which is applicable to some of us. I think the discussion has been chiefly confined to those parties who can utilize their tars and naphthas, and find a ready market for them. But in small works we find a difficulty in disposing of our tars and naphthas, and some have to give them away for very little, and I say that if this

process can add to the quantity and illuminating power of our gas, it will prove of great benefit to the managers of small works.

Mr. HISLOP: I think we must be all of one mind in regard to the simplicity and beauty of this arrangement. The whole question seems to resolve itself into a question of commercial value. The results have already been furnished in the JOURNAL OF GAS LIGHTING, and, after the experiments exhibited, it remains for each man to determine whether, according to his circumstances as to the disposal of the tar, it would be an advantage to use this process or not. At the same time I think it well that the patentees of this process should prosecute the thing further, and endeavour to satisfy the minds of the managers throughout the country as to the utility of the process, and the advantage to be derived from it. In certain cases it would be certainly an advantage, while in others it might be the reverse.

Mr. ROBB: I see that, if we were to adopt this process, we would have to face a large increase of plant, and we would be obliged to use a much higher class of coal, so that I am afraid in the end we would not profit by the change.

Mr. YOUNG: If you use a high-class coal, you have a certain quantity of naphtha left in the tars, and, if you use poor coal to take it up, you get the benefit in your gas. It is not necessary to increase the plant, it is only necessary to use a poor coal to take up the surplus of the hydrocarbon given off from the rich coal. The poor coal is to be utilized for that reason. We mix the coal at the present moment, and get the poor coal to carry away the hydrocarbons. This process is simply to utilize the vapours by diffusing them through the gas.

Mr. MITCHELL: Mr. Young has so fully answered every question that I find it unnecessary to add anything to what he has said.

The PRESIDENT: I am sure we thank Mr. Mitchell for the able and intelligent exposition he has given of this beautiful process. No doubt a considerable quantity of hydrocarbons remain in the tar, and the question simply comes to be—Is it more profitable to analyze the tars and get the naphthas diffused through the gas in the form shown by Mr. Mitchell, or to use the tar in the ordinary way? Whether is the naphtha more valuable than the extra illuminating power diffused through the gas? At the same time, I cannot think there can be the slightest doubt, if the permanency of the gas is established, that this process would be beneficial to small places where there is a difficulty in getting the tar removed, and where it has to be given away for a trifle. In other places the advantage would not perhaps be so great. On the whole, I think this is a process well worthy of our consideration, and if Mr. Young can show that for every grain of naphtha diffused through the gas there is an increase of 5 per cent. in the illuminating power of the gas, I think there will be no doubt of its success. The difficulty will be in getting the naphtha so diffused through the gas as to make every grain equal to that increase. I think we are entitled to give both Mr. Mitchell and Mr. Young a hearty vote of thanks for the manner in which they have brought forward this important and interesting subject.

(To be continued.)

EXETER WATER SUPPLY.

At a Meeting of the Exeter Town Council, on Wednesday, the 25th inst. —the MAYOR (Mr. Cuthbertson) in the chair—

The TOWN-CLERK read the following report of the committee of citizens appointed to consider the question of the water supply for the city:—

The committee approached its labours with the feeling that there were two great objects which the citizens had at heart—one, the abolition of an additional impost on the water-rate, and the other the obtaining, if possible, a constant supply of water from a pure source, incapable of being contaminated by any sewage matter.

The committee being aware that, during the year preceding the commencement of their labours, the town council had endeavoured to negotiate for the purchase of the works and property of the existing water company, but had failed to do so, on the ground that the terms demanded by the company appeared to the council exorbitant, addressed themselves first to the consideration whether a new company could wisely be formed, and their first step for this purpose was to ascertain from what sources, if any, water of the character required could be introduced into the city, and the committee called in the services of the eminent engineer, Mr. Galbraith, requesting him to examine and report to them whether water could be so introduced from Dartmoor, and at what cost.

Whilst this report was being prepared, the committee were requested by Mr. Arthur C. Pain, C.E., to consider a report prepared by him for bringing water to the city from the Blackdown Hills. Other reports from other engineers were also placed before the committee, but, on a consideration of the different schemes, they decided to limit their attention to those of Mr. Galbraith and Mr. Pain, as the most practicable. Samples of water from each source were carefully obtained, in the presence, in each case, of the engineer and the members of the committee, and both samples were submitted for analysis to Professors Voelcker and Redwood.

With this report are copies of the report from each engineer, and of the analysis from each analyst. It will be seen that in both cases the water is pronounced to be excellent; while the cost of the works, which includes new service-pipes where necessary, so as to carry a constant supply, is, in the case of Mr. Galbraith's scheme, £110,000; in that of Mr. Pain's, £91,315; this latter being without the cost of a new reservoir, which this scheme does not contemplate.

With these materials before them, the committee had to face the question of a new company, and, after mature deliberation, have arrived at the conclusion that, although it would not be impossible to form such a company—especially if there was a reasonable expectation that the works, as soon as constructed, would be bought by the town council—yet that such a course might fail; that it must inevitably lead to expensive, perhaps protracted litigation, and possibly end in an unsatisfactory compromise. Moreover, the committee felt, and believed that the citizens generally feel, also, that, while it is most desirable to have the management of the water so necessary for sanitary purposes in the hands of the sanitary authority, and while it is also most necessary that the city should be supplied with pure water, it is not proper to carry out any confiscation of property, nor to do any injury to existing interests, if a disposition is shown to meet the citizens in a fair spirit.

For these reasons, the committee came to the conclusion that the wiser course would be for them to consider whether the additional income to be derived by water-works in the hands of the town council by reason of the general rate leviable by them, and the absence of all pumping expenses, which are dispensed with in the schemes before the committee, would not permit a purchase of the existing works, a sale and utilization of some of the property, and the establishment of one of the newly proposed schemes, with little if any, annual loss, and with considerable advantage.

It has not, of course, been possible for the committee to approach the water company officially, so as to ascertain whether they would now be disposed to sell their works, and, if so, whether on any altered terms from those hitherto made public. The committee were appointed on a footing antagonistic to the company, and have no buying powers, so that the company could not be expected to make known to them the details of their position, or terms; but, taking the public reports of their income, and assuming a reasonable demand from them, in the shape of dividends on their share capital, the committee are of opinion that if the works are acquired by the city, the annual income payable to the shareholders, and the interest on outlay for a new scheme, repayable in 50 years, might all be met by the rates accruing to the council as the public suppliers of water without the objectionable impost recently attempted to be levied, or that if there were any balance against the city it would be covered by a rate of a penny in the pound. It is also to be noticed that in both the schemes on which reports are sent herewith, other places may be supplied with these waters and contribute to the expense, and there are various other ways, notably, that of supplying manufacturers and traders in the town, with water for hydraulic pressure, by which an additional income may be obtained. Moreover, inasmuch as money for this purpose can be borrowed of the Government, at 4½ per cent., paying capital and interest in 50 years, at the end of that time the whole, or a great part of the rates leviable, would cease, and the city would be in the possession of a valuable property, or a large annual income.

It should be stated that the engineers reports sent herewith, while providing sufficient service-pipes for a constant supply, do not include the necessary tap alterations in each house, this being a matter for each householder to supply for himself, as he may decide to have the constant supply placed within his reach. With regard to the question of the charge on water-closets, in the place of the larger proposal above set forth, this particular question assumes smaller proportions, and need not be so fully entered into. It will, however, be enough to say that the committee appointed by the different parishes obtained counsel's opinion on the subject, and were advised that closets within houses fall within the "domestic purposes" contemplated by the Act, and this committee advise a refusal to pay the rate on any such closet.

It will be seen from the above report, that the possibility of carrying out a scheme so beneficial to the city depends upon the manner in which the town council is met by the existing water company. The committee cannot but hope that the company will treat the question in a wide and liberal, though, at the same time, business-like manner; but still the committee do not feel that the city is entirely at the mercy of the company. It is true that there is not in their special Act any compulsory liability to sell by open arbitration, which exists in most recent Acts of the same character, but it is evidently the feeling of the Legislature that such a liability should attach to every water company; and in the recent case of a water company such a clause was, upon the application of the town council to Parliament, added to their Act.

With a scheme before them so beneficial to the city, the committee cannot doubt that a similar application by the town council of Exeter would be equally successful, but they hope and believe that such a step will be unnecessary. They hope that the water company will fairly meet the town council in this matter, if it should be disposed to approach it; and they beg to place this report most respectfully before the council, in the hope that it may be the beginning of a great and beneficial work for Exeter.

After some conversation, the report was referred to a committee of the whole council for consideration.

METROPOLIS GAS SUPPLY.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone during June, supplied by The Gaslight and Coke Company:—

	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogen.
	*Mean of 24 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Gas supplied from the Fulham works . .	16·53	17·11	16·10	23·87	8·52	16·72	0·63	No trace
Gas supplied from the Beckton and Bow works	16·54	17·04	16·11	37·88	16·26	14·11	0·60	No trace
Cannel gas supplied from the Pimlico works	20·83	21·30	20·31	24·14	13·67	16·23	0·40	No trace

Mean of daily readings of barometer, . . . 29·87
" " " thermometer . . . 73·33

*Each observation consists of ten readings of the photometer, at intervals of one minute.

On no occasion during the month was either of the three gases consumed in the parish below the legal standard of illuminating power, but, on the contrary, their mean light was fully half a candle above it. The mean illuminating power of the gas manufactured at the Fulham works was equal to 16½ candles, and ranged between 16·10 and 17·11 candles. The mean of the gas manufactured at Beckton and Bow was equal to 16½ candles, and ranged between 16·11 and 17·04 candles; the mean light of the cannel gas made at the Pimlico works was equal to nearly 21 candles, and ranged between 20·31 and 21·30 candles. The mean amount of sulphur found in 100 cubic feet of the Fulham gas was under 17 grains, in the Beckton and Bow gas it was 14 grains, and in the cannal gas rather over 16 grains; the ammonia in each was a little over half a grain. The pressure of all the gases was high during the early lighting hours, and on no occasion was a trace of sulphuretted hydrogen detected in either of them by the ordinary tests.

METROPOLIS WATER SUPPLY.

Dr. Whitmore's report on the composition of the Thames companies and other waters supplied to Marylebone during June:—

—	In Grains, per Gallon.			In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlorine.	Free Ammonia.	Albumenoid Ammonia.	Hardness.	Hardness after boiling Fifteen Minutes.
West Middlesex	19·36	0·80	1·08	0·00	0·07	13·1	2·6
Grand Junction	18·58	0·80	1·10	0 00	0 07	12·6	2·6

* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water; the total solid matter, *minus* such loss, consisted principally of carbonate of lime, with small quantities of other equally harmless salts.

The water of both companies has now reached its usual summer purity. As seen through a glass tube 2 feet in length, it was perfectly clear, bright, and colourless, and free from either taste or smell, but unless householders will keep their cisterns and other water receptacles perfectly clean, and take care also to place them where the water contained in them cannot absorb the foul emanations from closets, dustbins, and untrapped drains, they must not expect this degree of purity will be maintained.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

In pig iron there seems to be a decided tendency to lower prices on the part of buyers, who allege that they must effect all possible economies in respect of the first processes, if they wish to be able to secure orders for finished iron. The smelters, as a matter of course, hardly share this view of the subject, and they allege that pig is already being sold at prices which barely cover the cost of production. This being so, they will be prepared to limit the output in every possible way, in order to maintain prices, and to prevent the market from being overstocked. For some time past, some of the Derbyshire smelters appear to have found better markets in Staffordshire and in Lancashire than nearer home for their pig, and they have consequently pushed their brands in those districts. Current prices are about a shilling under those of last week, and in some cases there is a weak holding at that. Merchant iron remains as before, with a very restricted demand, and prices purely and entirely nominal.

At the larger foundries there is a continuance of the moderate activity reported on former occasions in these columns.

The coal trade is weak in all directions, and every week brings a keener and more formidable competition. In house coal this competition leaves very bare profits, especially to those in the London trade. Steam coal is in good request just now for export, and for gas coals there is some little stir, consequent upon the settlement of contracts for the coming season.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The resumption of work in the Wigan district has not yet had any material effect upon the Lancashire coal trede, but there seems to be an impression amongst buyers that, as soon as the pits get into full operation, the additional quantity of coal thus thrown upon the market will cause a downward tendency in the price of some descriptions of fuel. In gas-making coals there is no material change to notice. What little has been sold during the last few days has generally been at the low prices which I have quoted in previous reports. One of the largest Wigan firms is making very low quotations to secure contracts, and the average prices ruling in the market are about 7s. 9d. to 8s. 3d. for ordinary screened gas coal, and 8s. 6d. to 9s. for Arley, at the pit's mouth. Cannel varies very much, according to quality, but in this description of coal some contracts have been taken at low prices. Round classes of coal, for house-fire purposes are in very limited demand, and considerable stocks are accumulating, whilst there is a disposition to press for sales at lower prices, good Arley at the pit mouth being offered at 10s., seconds ditto at 8s. 6d. to 9s., and Pemberton four-feet at 8s. per ton. Common coal is only in moderate demand, and prices are weak, the average quotations at the pit's mouth ranging about 6s. 6d. to 7s. per ton. Although common sorts of burgy are being pushed on the market at very low prices, the better descriptions continue steady, and good Wigan burgy fetches from 5s. 6d. to 6s. 3d. per ton at the pit. Slack continues in good demand, and sellers are firm at from 4s. 6d. to 5s. per ton for the good qualities.

The iron trade is without improvement, but prices are not materially lower. Local smelters are securing very few new orders, and the finished iron establishments have in many cases been put on short time. For Lancashire bars delivered into the Manchester district, makers are still asking about £6 12s. 6d. per ton, with other descriptions of finished iron in proportion.

THE COAL AND GENERAL TRADE OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

There was, last week, another considerable arrival of vessels in the coal ports of the North of England. A good few coasters were to hand. They were all taken up to load coals, and there was little reduction in freights. They were pretty much about the same as the previous week—namely, 5s. 9d. to London, to load at the wharves; Rochester, 5s. 6d.; Great Yarmouth, 5s.; Lowestoft, 4s. 6d. per ton. French rates, for smaller ships, are from £8 to £8 10s. per keel; Dutch, from £7 to £7 7s. 6d. per keel. The freight paid to steamers to load coals for London is 4s. 3d. per ton for immediate employment, and for six months 4s. 6d. per ton; Rochester is 4s. 6d. per ton; Hamburg, £5 10s. per keel. Foreign rates are very low generally. There were very good shipments of gas coals from the Tyne dock last week; in fact, they were equal to a fair consumer's average in ordinary times. Steamers took a good few gas coals away, both for coasting and abroad. The price is unaltered. Very best is quoted at 8s. 6d. A good medium is sold at 7s. 6d., and inferior, 6s. The demand for the best qualities of steam coals, though not very excessive, is better than might have been anticipated. The loading turns are equal to a fortnight, and the price of very best is 12s. 6d. per ton, less from 2½ to 5 per cent. discount. Second-class steam is from 10s. to 10s. 6d. per ton, with a fair inquiry. The pits generally are very well employed. They will work up to from eight to ten days per fortnight, taking them as an average. House coals are in poor demand. Best sorts 12s. upon the Wear, and 11s. on the Tyne. The shipments of material for building purposes are the most active for London and France. The business to Germany is very poor, and the prospects are not remarkably good. Fire-clay goods and fire-bricks are shipped coastwise to France, and to British America, but there is no great inquiry from any other parts of the world. The chemical trade is excessively flat, and the Cleveland iron trade gets no better. The price of iron, the price of chemicals, and the rates of freight, as a rule, paid to vessels of all kinds to load coals for the Baltic have scarcely ever been so dull as at the present moment.

It is anticipated that in two or three days the umpire's decision with regard to the proposed reduction of wages of the Northumberland miners will be known. Work is going on very steadily at the Durham collieries, amongst the miners who have a sliding scale, and regulate wages according to the price of coals. The masters, however, have had some trouble with what are called off-handed men, and there has been a difficulty in arranging a reduction of wages with them.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Friday the accounts of the Arbroath Gas Corporation, for the year ending May 31 last, were submitted to a meeting of the Finance Committee. The statement showed that there had been a profit of £525 9s. 7d., as against a profit of £494 14s. 2d. in the preceding year. The revenue for the past year was £8486 4s., that from the sales of gas amounting to £7573 18s. 3d., and that from meters being £506 18s. 2d., or a total of £8080 16s. 5d., which, with other items, amounted to £8980 18s. 2d. On the revenue from sale of gas and meter-rents there was a decrease of £1044 11s. 11d., as compared with the income during the preceding year. This large decrease is, no doubt, largely attributable to the dulness in the staple trade of the town during the year, and it was also stated at the meeting that there had been a falling off in the gas bills of the smaller consumers. The revenue from residual products was £393 18s. 10d., being an increase of about £27, as compared with the revenue from the same source in the previous year. With regard to the expenditure, the principal item was, of course, for coal and lime, which amounted to £3329 8s., being £1008 7s. 3d. less than in the year ending May 31, 1876. The annual meeting of the corporation for the consideration of the balance-sheet is to be held on Monday.

Five shares of the Arbroath Corporation gas annuities were offered for sale by public auction on Saturday, the 21st inst. They were exposed at £32, and three of them brought £32 6s. each, while the other two were sold at £32 8s. each.

The annual meeting of the Crieff Gaslight Company was held on Monday, the 23rd inst. On the recommendation of the directors, it was resolved to declare a dividend of 10 per cent. on the profits of the past year's transactions. There was no reduction proposed on the price of gas, which still remains at 7s. 6d. per 1000 cubic feet. The meter-rate of 2s. per annum, which is considered by some of the consumers to be a very unreasonable charge, is still to be continued.

At a meeting of the Wishaw Gas Company, held last Thursday, Mr. Waddell, Kirkfield Bank, was appointed manager of the gas-works out of a list of upwards of 40 applicants. The Police Commissioners of Wishaw held a special meeting on Friday for the purpose of adopting the preliminary steps with the view of taking over the gas-works under Sir Windham Anstruther's Gas Supply Act. However, as the water extension scheme and a proposal to take over the management of the police force are, in the meantime, contemplated, it is thought that fully a year must elapse before the gas supply of the town can be in the hands of the Police Commissioners.

A meeting of the Elgin Town Council was held last Tuesday for the purpose of taking the necessary measures for the adoption of the Burghs Gas Supply Act. Provost Culbard moved that the Act should be adopted, and Bailie Whyte seconded the motion, which was agreed to.

The directors of the Bo'ness Gaslight Company have declared a dividend of 7s. per share of £6 on the profits of the past year's transactions, and the price of gas has been reduced from 5s. 5d. to 5s. per 1000 cubic feet, the reduction to take effect from the last survey, which was made in May.

A propos of the recent extension of the Broughty Ferry Gas-Works, it has just been mentioned that 30 years ago a gasholder capable of containing 8000 cubic feet of gas supplied the village with light, whereas the storeage accommodation now amounts to 105,000 cubic feet. In 1854 the yearly consumption was 1,900,000 cubic feet, and last year it amounted to 17,158,200 cubic feet.

While the workmen at the new gas-works, Lochee, were engaged last Tuesday morning in lowering a large box of cement, weighing nearly a ton, it came down on one of the workmen, named William Booth, about twenty years of age, and crushed him severely. Had it not been observed by some of the workmen, who made strenuous exertions to save Booth, the result must have been instant death. Dr. Alexander was called, and, although the man was injured very much inwardly, the doctor did not anticipate any serious result.

For some time past workmen employed by the Glasgow Corporation Gas Committee have been engaged in replacing the old service-pipes with new ones in many streets of the city. High Street, East George Street, and others in the centre of the city, were finished a few weeks ago. Buchanan Street, St. Enoch Square, and Argyle Street, have more recently been receiving their attention. The workmen carry on the necessary operations with remarkable speed, the tearing up of the pavement, the renovation of the pipes, and replacing of the flagstones being performed with the greatest possible expedition. The work has been attended with a little inconvenience to the public, and some expense to the Gas Committee, but ultimately it will be to the advantage of both—the public will, no doubt, have more and better light, and the committee will effect a saving of gas, as the new pipes will do away with any leakage that may formerly have existed.

Following the example of the Glasgow and Perth Gas Commissioners, the Inverness Gas Commissioners now regularly issue a weekly statement of the illuminating power of the gas which they supply to the town. The return for the week ending the 21st of July gives the following statement:—Maximum, 27·05; minimum, 26·87; average illuminating power, 26·96 sperm candles. The return for Perth for the same week is as follows:—Maximum, 27·57; minimum, 27·00; average light, 27·30 candles. The Glasgow gas during the same week at three testing-stations had an average illuminating power ranging from 26·77 candles to 27·67 candles, the highest maximum at any station being 27·98 standard candles.

At present arrangements are in progress for laying a large part of Kirkcaldy with 15-inch gas-pipes, which are said to be certainly the largest gas-pipes in Fifeshire.

A fear was lately expressed in the public newspapers that the Glasgow Corporation Gas Committee were likely to get into a pecuniary difficulty by not purchasing their usual winter's supply of gas coal in time; that, in short, they would have to "pay dear for their whistle." It was said that they had purchased only some 25,000 or 30,000 tons of coal, whereas their total wants for the year amounted to 185,000 tons; but I have good reason for saying that fully two-thirds of the whole have been secured on very favourable terms.

A special joint meeting of the Irvine Local Authority and Halfway Committee of the Local Authority of the parish of Dundonald was held on Thursday last, in connexion with the water supply of Irvine—Mr. W. D. M'Jannet in the chair. The Eglinton Chemical Company's scheme for drawing from the river Irvine, for the use of their works, a supply of water amounting to 300,000 gallons per day was considered, and a draft of conditions on which the scheme should be sanctioned, drawn up by a committee of the town council, was submitted. These were, with a few slight alterations, agreed to; but one important condition was added, that the local authority should, in dry seasons, have the right to stop pumping for a fortnight at a time. The meeting also reserved the right to reconsider whether they should not be entitled to a certain lordship upon every 1000 gallons abstracted from the river. The clerk stated that the terms on which the Public Works Loan Commissioners had agreed to a loan of £24,000, applied for in connexion with the water supply, was £4 13s. 2d. per cent., payable for 50 years.

The Town Council of Rutherglen, an ancient royal burgh, on the south-eastern boundaries of Glasgow, are taking steps to secure an independent water supply. Samples were obtained last Thursday of four different qualities of water, from sources said to be ample and available, and have been sent for examination to Messrs. Wallace, Tatlock, and Clark, public analysts, Glasgow.

It is expected, if not even resolved, that the Burntisland Town Council will receive a loan of £25,000, at 4 per cent. interest, from the Public Works Loan Commissioners, for the execution of the new water-works.

The magistrates and Town Council of Aberdeen made their annual inspection of the water-works under their charge last Wednesday. In connexion with that event, it may be worth while to mention a few facts regarding the Aberdeen water supply. The extension of the supply works was authorized by Act of Parliament in 1862, the first turf was cut in 1864, and the water was turned on in 1866 by the Queen, the entire cost of the works, &c., being £165,401 12s. 2½d. up to last September. In 1867 the daily consumption was about 2 million gallons, whereas it is now 4 million gallons; and the revenue has risen during the last ten years from £7000 per annum to £11,000, while the water-rate has been reduced from 1s. 3d. to 10d. per £1 of rental, and there are indications of a still further reduction. It may also be mentioned that during the twelve months ending June, 1877, the rainfall at Aberdeen amounted to the large total of 40·543 inches, whereas the average of twenty years is only 31·805 inches.

The third annual meeting of the Busby Water Company was held on Saturday, the 21st inst., when it was announced that the first year's operations of the company in supplying the district with water had given general satisfaction. The reservoirs and other permanent works were, it was said, nearly completed. After approving of the directors report, it was resolved to issue at par 300 ordinary shares of £10 each.

A very firm tone has characterized the Glasgow pig iron market during the past week, especially since Wednesday, when it was resolved to blow out about one-third of the blast furnaces, so as to lessen production to the extent of 14,000 or 15,000 tons per week. Buyers at the close on Friday were offering 54s. 10½d. cash, and 55s. one month, the advance on the week being 7½d. per ton.

The coal market is again quieter, and the prices will probably decline still further, now that so many furnaces are to be blown out.

REDUCTIONS IN THE PRICE OF GAS.—The price of gas to private consumers at Devonport has been reduced from 3s. 6d. to 3s. 3d., and the charge for the public lamps has been reduced 4s. each, making, with a previous reduction, the present charge 8s. per lamp less than the contract price. At Halesworth a reduction has been made from 5s. 10d. to 5s. 5d.

SALE OF NEW RIVER SHARES.—At the Auction Mart, London, on the 24th inst., a lot consisting of a 100th of a King's (James I.) share in the revenues and properties of the New River was sold for £780. There was an active competition, and the bidding, which began at £500, was carried on by tens until the above amount was obtained. The increase in the revenue of the New River Company is remarkable, seeing that since 1861, when it amounted to £202,250, it had last year reached £383,029, and in the interval bonuses to the amount of £2400 were paid on each original share.

A PERUVIAN GAS MANAGER'S TROUBLES.—We have been favoured with the perusal of a letter, dated the 8th ult., from the Scottish manager of a Peruvian gas-works, and from it we make the following extract:—"We have been suffering great disasters here from earthquake, inundations of the sea, revolutions, &c. No doubt, through the public press, you will have seen some accounts of these things, but no written details can give you any idea of the horrors and misery such visitations give rise to. On the 9th of May, at half-past eight at night, the earthquake commenced. I had gone to bed early that night, not feeling very well. As soon as the shaking commenced I sprang out of bed, and, seizing my clothes, made for the door. Going downstairs I had to hold by both hands, and thought every moment the house was going to fall. Had it been built of stone it never could have stood; but, as you are, perhaps, aware, nearly all the houses here are built of wood, and a good job they are so; had they been built of stone, thousands would have been killed that night. Just as I got out of my door in the works the retort-stack fell. I had upwards of a thousand tons of coal piled up to a good height, and they all came down with a great rumbling noise. The iron roof of my retort-house also fell in. You can form some kind of idea of what the noise would be. I got out at the gate into the street, and what a scene was there! Men, women, and children frantic with fear, some screaming, others praying. I shall never forget the scene as long as I live. The heaving of the earth and the noise were something awful. In trying to walk or run you appeared as if you were drunk. The earthquake continued for at least five minutes; those five minutes seemed a lifetime. After this ceased, the great fear was the sea, which generally, after an earthquake such as this was, rises and sweeps everything before it. I went back to my house, put on my clothes as fast as ever I could, came downstairs again, and saddled my horse so as to be prepared for a run. The horse was nearly mad with fear, and I had a sore job to get him saddled. Then I thought to myself, if it so happens that the sea does come in it would be as well to have some money, so that I may not be left desolate in a foreign country. I went into my office, opened the safe, and took out 3000 dollars in paper, which I had ready for banking the following day. This I put in my pocket, locked the safe, and got to the office-door, when the cry arose the sea was coming in. I then thought it was all up. I sprang on my horse, and away I went like the wind to the hills. As I left my gate I heard the crashing of houses, &c., caused by the sea, not fifty yards behind me. I passed that night amongst hundreds of others on the hill-side, and such a night! Nearly every hour there was an earthquake—none so strong as the first one, but all alarming. Morning came, and I went down to the town to see what damage was done; and such a sight in the lower part! Everything was destroyed, whole streets washed away. I went up to the gas-works to see what damage was done there, and found it not so bad as I had anticipated. The water did not reach the length of my retorts; all the lower part of the works was washed away, but little of the working part of the works destroyed. The pipes in the town suffered severely. Had my mains not been jointed with india-rubber, they, too, would have been seriously damaged. A great many of the services were broken right away from the mains. I started with all the men I could get, and had things put to rights. You may know I was not idle when I had gas on the town the second day after the catastrophe. I am still very busy, but in a short time I trust to have everything ship-shape. I intended giving you a description of the revolution, but neither time nor space will allow me at present."

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

2766.—CANHAM, W., Liverpool, "Improvements in pumps." July 20, 1877.
2787.—TIDCOMBE, G., jun., Watford, Herts, "Improvements in means or apparatus for heating and ventilating greenhouses and other places by means of gas." July 21, 1877.
2811.—ANDREW, T., Commercial Street, London, and DEACON, S., Reading, Berkshire, "Pumping liquids or semi-liquids by means of a loose cylinder, inserted in an ordinary pump-barrel in such a manner as to dispense with all ordinary valves." July 24, 1877.
2842.—WALLACE, R. W., and CLAUS, C. F., Southall, London, "An improved process for utilizing gas liquor in the manufacture of carbonate of potash and other salts, and sulphuric acid, and in apparatus therefor, which apparatus is also applicable for other like purposes." July 25, 1877.
2843.—LAKE, W. R., Southampton Buildings, London, "Improvements in water-meters." A communication. July 25, 1877.
2844.—WOLLASTON, C. J., Kensington, London, "Improvements in the treatment of sewage and in deodorizing and disinfecting substances resulting therefrom, and other offensive matters." July 25, 1877.
2860.—KIDD, J. and J., Wandsworth, London, "Improvements in means and apparatus for applying heavy oils to illuminating purposes." July 26, 1877.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

480.—ROSS, W., Glasgow, "Improvements in apparatus or valves for regulating and supplying uniform quantities of water to, and preventing waste in, water-closets, urinals, and other vessels." Feb. 5 1877.
528.—PERRETT, E., Westminster, "Improvements in filters." Feb. 7, 1877.
556.—LAKE, W. R., Southampton Buildings, London, "Improvements in water-engines and pumps." A communication. Feb. 9, 1877.
640.—HADDAN, H. J., Westminster, "Improvements in apparatus for cutting pipes, columns, shafts, and such like." A communication. Feb. 16, 1877.
824.—TURNBULL, R., Glasgow, "Improvements in collecting and purifying sewage, and in the apparatus or means employed therefor." March 1, 1877.
842.—TRULL, C. K., New York, U.S.A., "An improved apparatus for lighting gas." March 2, 1877.
1063.—LAKE, W. R., Southampton Buildings, London, "Improvements in gas motor engines." A communication. March 16, 1877.
1470.—LINFORD, C., Leicester, "Improvements connected with gas-engines." April 14, 1877.
1814.—KIRKHAM, T. N., C.E., Westminster, HULETT, D., High Holborn, and CHANDLER, S., and J., Newington Causeway, London, "Improvements in apparatus for the purification of gas." May 10, 1877.
2033.—LAKE, W. R., Southampton Buildings, London, "Improvements in gas-meters." A communication. May 24, 1877.
2177.—CROSSLEY, F. W. and W. J., Manchester, "Improvements in gas motor engines." Partly a communication. June 4, 1877.
2238.—NEWMAN, J., Litchurch, Derby, "Improvements in apparatus for transmitting gas from the retorts to the hydraulic main." June 8, 1877.
2269.—EELLS, A. F., and LOUD, S. C., Boston, U.S.A., "Improvements in pumps." June 11, 1877.

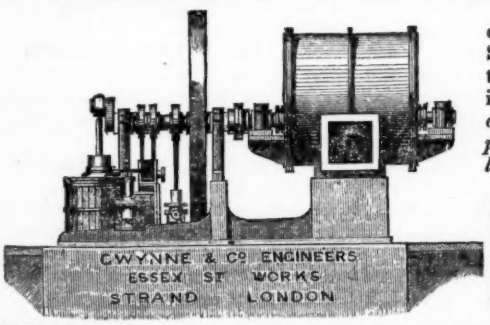
PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2103.—RAFFERTY, T., "Improvements in apparatus used in connecting surface pipes, cocks, and plugs to main gas-pipes." June 17, 1874.
2185.—GAMBONI, P., "Improvements in pumps or apparatus for raising or forcing air or water." June 23, 1874.
2197.—NEWTON, H. E., "Improvements in gas-burners." June 24, 1874.
2209.—HASELTINE, G., "Improvements in gas-engines." June 25, 1874.
2270.—CLARK, A. M., "Improvements in the manufacture of gas and fuel." June 30, 1874.
2318.—KUNSTADTER, J. J., "Improvements of apparatus for causing the flow of liquids, and also in apparatus to obtain motive power from the flow of liquids." July 3, 1874.
2338.—WELLS, J., "Certain improvements in main-cocks for gas and water purposes, but which said improvements are also applicable for main-cocks for the controlling of other fluids." July 4, 1874.
2371.—WALKER, W., "Improvements in direct-acting steam pumping-engines." July 7, 1874.
2397.—WILSON, H., and STEEL, J., "Improvements in apparatus for cooling and heating liquids and gases." July 8, 1874.
2404.—COOPER, H. E., "Improvements in the means of and in apparatus for carburetting air or gas for illuminating or heating purposes." July 8, 1874.
2434.—WARREN, S. H., and WATES, P. J., "Improvements in machinery and apparatus for charging and drawing retorts." July 11, 1874.
2439.—SCHMERSAHL, A. E., "Improvements in treating sewage water and other foul liquids for the purpose of purification, and in the manufacture of manure." July 11, 1874.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION. have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

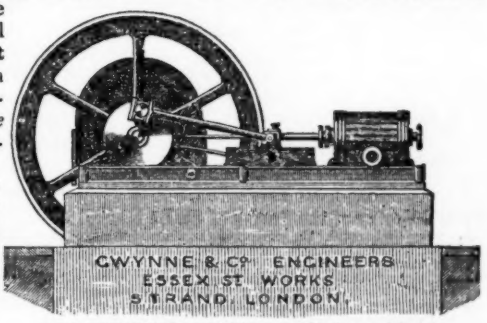
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

☞ *G. & Co. are now making 6 Sets Exhausters and Engines for 105,000 cubic feet per hour, 3 Sets 180,000 Exhausters and Engines, with many others of all Sizes.*

WANTED, by a Young Man who has served his apprenticeship to a Gas Engineer, a situation as MANAGER of a small Gas-Works, or to act as Assistant to the Engineer of a large Works; has had good practical experience, and can be strongly recommended.

Address No. 382, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the Address of Gas Officers who have not received a Copy of the New Edition of PAMPHLET for GAS COMPANIES to distribute to their Gas Consumers—"Cooking and Heating by Gas." A Copy will be sent free—extra Copies by post Threepence—direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

GAS-WORKS SUB-MANAGER.

WANTED, by the Corporation of Walsall, a working SUB-MANAGER for the Walsall Gas-Works. Salary £200 a year. The appointment to be subject to three months notice on either side.

Applications, accompanied with not more than three testimonials, to be sent to the undersigned on or before Monday, the 13th of August. Each applicant to state how soon he could enter upon the duties.

Applicants canvassing the Members of the Corporation will be disqualified.

A statement of the duties and conditions of the appointment may be obtained on application to the undersigned.

SAML. WILKINSON, Town-Clerk.

Walsall, July 25, 1877.

GAS MANAGER.

WANTED, in a small Gas-Works (where there are from five to eight retorts used in the winter, and two or three in the summer, and the annual make is about 2½ millions), a WORKING MANAGER who thoroughly understands the making and distribution of gas. He must be competent to put up gas-fittings and lay service-pipes when required. A stoker is kept during a greater portion of the year. There is a good house and garden.

Address, stating wages required, including house, coal, and gas, No. 390, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two good, steady, respect- able, sober Men, as STOKERS; those used to an exhauster preferred. Constant employment, overtime paid. Wages 26s. per week.

Apply, with testimonials or reference, to Mr. W. H. SLIP, Engineer and Manager, Gas-Works, Slough, BUCKS.

WANTED, for New Zealand, a Gas- FITTER and WHITESMITH, and a PLUMBER. Both must be thoroughly efficient workmen, fully acquainted with their trade duties, and possess good references as to steadiness and ability.

Applications to be sent at once by post to N. Z., care of Messrs. W. Dawson and Sons, 121, CANNON STREET, E.C.

THRAPSTON GAS AND COKE COMPANY, LIMITED.

IN consequence of the Resignation of their Manager, through ill-health, the Directors of the above Company require the services of a WORKING FOREMAN, who must be competent to take the entire charge of the Works, execute the Company's Fittings, &c. Good wages, house, &c., &c.

Particulars may be had of the SECRETARY, at THRAPSTON.

Thrapston, July 25, 1877.

THE Ellen Royde Brick and Tile Com- pany, Limited, Halifax, are in want of a thoroughly practical Man as TRAVELLER and MANAGER for Fire-Bricks, Gas-Retorts, and Sanitary Tubes. Fixed salary and commission.

Apply by letter.

REQUIRED, a competent Gas-Fitter and REPAIRER of METERS. None need apply whose character will not bear strict investigation. Wages 28s. per week, overtime paid.

Applications to be made by letter, addressed No. 391, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS AND WATER ENGINEERS.

THE Birkenhead Improvement Com- missioners require the services of a Resident ENGINEER of their Gas and Water-Works. He must be thoroughly experienced in the manufacture and distribution of Gas, and also understand pumping manchinery and water distribution, and be competent to design and carry out additions to and extensions of both Gas and Water Works. Salary £400 per annum.

Applications (with recent testimonials), addressed to "The Chairman of the Gas and Water Committee, 50, Hamilton Square, Birkenhead," and endorsed "Engineer," to be sent in not later than Friday, the 17th of August next. Personal canvassing prohibited.

By order,

AMBROSE WALN, Clerk to the Commissioners.

Birkenhead, July 16, 1877.

GAS-LAMP INSPECTOR.

THE Vestry of the Parish of St. Leonard, Shoreditch, require the services of a competent person as LAMP INSPECTOR, to take charge of the Lamplighters, and superintend the Lighting, Cleaning, and Repair of Lamps, Meters, &c.; to read Meter Indexes, and generally to perform all similar duties connected with the public lighting of the parish. No person will be eligible who has not had practical and mechanical experience in relation to gas supply and apparatus. He must produce testimonials of recent date from competent authorities to that effect, and be between 30 and 45 years of age. Salary £150 per annum.

Candidates must send in applications and testimonials not later than the 15th of August, addressed to me, and endorsed "Gas Lamp Inspector."

Such candidates as the Committee may desire to see personally will be written to.

By order,

E. WALKER, Vestry-Clerk.

Shoreditch Town-Hall, Old Street, London, E.C.,

July 30, 1877.

TO BE SOLD CHEAP, Four Purifiers, 10 ft. by 8 ft. Offers to be sent to the undersigned.

GEORGE E. SAVILLE, Gas-Works, SOWERBY BRIDGE.

GASHOLDER FOR SALE.

ONE Telescopic Gasholder, 70 feet by 20 feet, complete, with cast-iron tank, columns, girders, and inlet and outlet pipes, valves, &c., of modern construction. In first-class condition, and made by Messrs. Pigott and Co., of Birmingham.

To be seen at work at the Gas-Works, Birkenhead.

Cause of removal to make room for extensions.

To be sold a bargain, taken down, and re-erected ready for work.

For particulars, apply to Messrs. ASHMORE AND WHILE, STOCKTON-ON-TEES, or to view to Mr. CALLOW, Gas Engineer, BIRKENHEAD.

FOR SALE—A Set of Four Purifiers, 8 ft. by 6 ft., with covers, grids, centre-valve, and 6-in. connexions complete.

Apply to J. GILL, Gas-Works, BRIDGNORTH.

FOR SALE—One Exhauster by Jones, of Birmingham, capacity 25,000 feet per hour, with bye-pass, 12-in. inlet and outlet pipes and valves complete, in first-class working condition, price £40; also one Exhauster Regulator, with chain and weights complete, price £5.

Apply to CLAPHAM BROS., Ironfounders, &c., Keighley, YORKS.

EXHAUSTERS FOR SALE.

TWO of Laidlaw's Patent Exhausters supplied by the Makers to pass 80,000 cubic feet per hour each; have been used only two months. Will be SOLD, together or separately, at half the original cost, or £100 each.

Apply to the ENGINEER, Crystal Palace District Gas Company, LOWER SYDENHAM, S.E.

TO GAS COMPANIES.

WE beg to call attention to our special STEATITE BURNERS for Street Lamps. Sample gross 8s. Quotations for quantities.

Messrs. TINDALL AND TELLING, Gas Apparatus Works, 74, Wynford Road, Penton Street, LONDON, N.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Winchester Water and Gas Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR produced at their Works for a period of One year, commencing on the 14th day of September next.

Particulars and forms of tender may be obtained on application.

Tenders to be sent in addressed to the Manager, and endorsed "Tender for Tar and Liquor," on or before Monday, the 3rd day of September.

FOR SALE, the Lease of two Small Gas- Works in a healthy and improving country town. Paying well.

For terms, address No. 388, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD, as they stand, for immediate removal, Four Cast-Iron PURIFIERS, 8 ft. by 4 ft., with wood sieves, cast-iron covers, and connexions.

Also an 8-inch Hydraulic CENTRE-VALVE and connexions.

The above have just been thrown out of use, being replaced by plant of larger dimensions.

Apply to Mr. W. H. SLIP, Manager, Gas-Works, Slough, BUCKS.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Brentford Gas Com- pany are prepared to receive, on or before the 14th day of August next, TENDERS for the purchase of the surplus make of TAR at their Brentford and Southall Stations, in accordance with the particulars to be obtained by applying to FRANK MORRIS, Engineer to the Company, at the Works, High Street, OLD BRENTFORD.

By order.

ROCHDALE CORPORATION.

THE Gas Committee of the Rochdale Corporation invite TENDERS for the supply of 60 yards of Turned and Bored GAS-MAINS, 30 in. diameter, coated with Dr. Smith's patent process, and delivered free at Rochdale Railway Station.

Particulars as to weights, &c., can be obtained from Mr. Paterson, Gas-Works.

Tenders, endorsed "Gas-Mains," to be sent to me on or before the 14th of August next.

By order,

ZACH. MELLOR, Town-Clerk.

Town-Hall, Rochdale, July 23, 1877.

MAIDSTONE GAS COMPANY.

TO TAR DISTILLERS, &c.

THE Directors of the above Company invite TENDERS for the purchase of the surplus TAR and AMMONIA LIQUOR produced at their Works during a term of Twelve months, delivered into Tank Barges alongside their Works. Quantities about 100,000 gallons of Tar, and 200,000 gallons of Liquor.

Specification of conditions and form of tender, &c., to be obtained on application to Mr. John West, the Company's Engineer.

Sealed tenders to be sent in on or before Tuesday, the 14th day of August, addressed to the Chairman of the Company, Gas-Works, Maidstone, and endorsed "Tender for Tar, &c."

The Directors do not bind themselves to accept the highest or any tender.

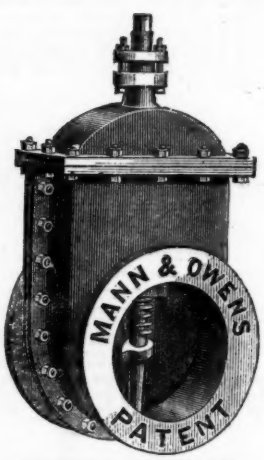
By order,

BEALE AND HOAR, Clerks.

Maidstone, July 27, 1877.

MANN & OWENS' PATENT GAS-VALVE.

EVERY VALVE WARRANTED TO BE PERFECTLY SOUND AND GAS-TIGHT.



VALVE, with Indicator for Above Ground. UNDERGROUND VALVE.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

SOLE MANUFACTURERS:

S. OWENS AND CO.,

HYDRAULIC AND GENERAL ENGINEERS,

WHITEFRIARS STREET, LONDON, E.C.

PRICES, SIZES, AND FULL PARTICULARS ON APPLICATION.

Now ready, price One Shilling, No. 9 (to be continued Monthly) of

A TREATISE ON THE SCIENCE & PRACTICE
OF THE
Manufacture and Distribution
OF
COAL GAS.

LONDON: WILLIAM B. KING, 11, BOLT COURT, FLEET STREET,
OR OF ANY BOOKSELLER IN TOWN OR COUNTRY.

For the convenience of persons resident in remote districts, arrangements have been made by the Publisher to forward the "Treatise" by Post, securely packed, at the cost of 1s. 2d. Monthly, or 7s. for the Half Year.

Now ready.

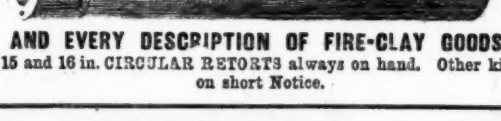
THE GAS & WATER COMPANIES DIRECTORY
FOR THE YEAR 1877,
EDITED BY
CHARLES W. HASTINGS,
8, BUCKINGHAM STREET, ADELPHI, LONDON, W.C.
THIS WORK IS UNDER THE PATRONAGE OF ALL THE LEADING GAS & WATER ENGINEERS AND SECRETARIES OF THE METROPOLITAN & PROVINCIAL COMPANIES.
Price 5s. in Cloth Covers; by post, 5s. 2d. | Price 3s. 6d. in Paper Covers; by post, 3s. 8d.
PUBLISHED BY MESSRS. MARCUS WARD & CO., OF LONDON AND BELFAST.

GAS PURIFICATION.

BAILES & HALLSWORTH,
CONTRACTORS FOR THE
PURIFICATION OF COAL GAS,
BY THEIR
PATENT OXIDE OF IRON COMPOUND.

The material is in use at most of the principal Gas-Works in Yorkshire and elsewhere. It contains considerably less moisture than natural Oxide of Iron. It is much cheaper and more efficient as a purifying agent.
B. & H. are purchasers of Spent Oxide, or will take Spent in exchange for New Material.
FOR SAMPLES AND TERMS, ADDRESS—
BAILES & HALLSWORTH, COPPERAS WORKS, ARMLEY, LEEDS.

JOHN HALL AND CO., STOURBRIDGE,
Manufacturers of FIRE-BRICKS, LUMPS, TILES,



AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

J. EDMUNDSON & CO.,
19, GREAT GEORGE STREET, WESTMINSTER,
LONDON, S.W.,
MANUFACTURERS OF EVERY DESCRIPTION OF
GAS APPARATUS.
CONTRACTORS FOR THE
ERECTION OF GAS-WORKS, GAS-FITTINGS, &c.,
FOR TOWNS, COUNTRY MANSIONS, &c.
Estimates given free of Charge.

JAMES MILNE & SON,
GAS ENGINEERS,
Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
EDINBURGH, AND
2, KING EDWARD STREET,
NEWGATE STREET, LONDON.
Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,
And every description of Gas-Fittings and Gas Apparatus.

BROMLEY GAS CONSUMERS COMPANY.

NOTICE is hereby given, that an EXTRAORDINARY GENERAL MEETING of the Bromley Gas Consumers Company will be held at the Bell Hotel, Bromley, on the 9th day of August next, at Six o'clock in the afternoon, to authorize the Directors to pay an interim Dividend, at the rate of 10 per cent. per annum, for the half year ending the 30th of June last.

Notice is also given, that a resolution will be prepared by the Directors to authorize the Company, under the provisions of the Bromley Gas Consumers Act, 1865, to create and issue 2000 new Ordinary Shares of £10 each, with a dividend limited to 7 per cent. per annum.

By order of the Board,
GEORGE H. OSBORN, Secretary.
Bromley, Kent, July 23, 1877.

OVER DARWEN LOCAL BOARD OF HEALTH—GAS AND WATER DEPARTMENT.

TENDERS FOR CANNEL AND COAL.

THE Gas Committee are desirous of receiving TENDERS for CANNEL and best screened GAS COAL that they may require for the Gas-Works, for the year commencing the 1st of August next, to be delivered, in equal monthly quantities, free at Over Darwen Station.

They will engage to take not less than 8000 Tons during the year, of the combined qualities that may be selected, about as follows:—7000 tons Coal, 1000 tons Cannel.

Sealed tenders, endorsed "Tender for Coal," specifying the description of Cannel or Coal, the pits at which they are to be raised, and quantities proposed to be supplied, to be sent to the undersigned on or before Tuesday, the 31st inst.

The person or persons whose tender may be accepted will be required to execute an agreement for the due performance of the contract, to be prepared by the Law Clerk of the said Board.

By order,
JOHN MARSLAND, Engineer and Manager.
Gas-Works, Darwen, July 5, 1877.

NEW GAS-WORKS.—TUNBRIDGE WELLS.

TO BUILDERS.

THE Directors of the Tunbridge Wells Gas Company are prepared to receive TENDERS for the Earthwork, Concrete Foundations, and construction of Coal-Store, Retort-House, Retaining-Wall, Station-Meter and other Houses, Clock-Tower, and Tar-Tanks, upon the site for their New Works adjoining the South-Eastern Railway, near the town.

Plans, sections, and specifications of the foundations and buildings may be seen at the Secretary's Office, 44, High Street, Tunbridge Wells, and at the Office of the Company's Engineer, Mr. R. P. Spice, 21, Parliament Street, Westminster, on and after the 27th inst., and lithographed copies of the quantities had of the Engineer, or of the Secretary of the Gas Company, on payment of one guinea for each copy.

Tenders, addressed to the Secretary of the Company at his Office, High Street, Tunbridge Wells, marked outside "Tender for New Buildings," will be received on or before Monday, the 27th of August.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
JOHN READ, Secretary.
Gas Office, Tunbridge Wells, July 21, 1877.

Now ready, price 5s., by post 5s. 3d., cloth, 8vo., gilt lettered,

SULPHUR COMPOUNDS IN GAS.

A full Report of the Evidence given before the Select Committee of the House of Commons on the Bills of The Gaslight and Coke Company and the Crystal Palace District Gas Company in the present Session.

LONDON:
WILLIAM B. KING, 11, BOLT COURT, FLEET ST.

Now ready, price 18s., bound in cloth, gilt lettered,

THE TWENTY-NINTH VOLUME
(JANUARY TO JUNE, 1877,)
OF THE
JOURNAL OF GAS LIGHTING, WATER SUPPLY, AND SANITARY IMPROVEMENT.

CLOTH CASES, GILT LETTERED,
For binding Vol. XXIX., may be obtained, Price 2s. 6d.

LONDON:
WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, E.C.

BOUCK & CO., LIMITED,
TAR DISTILLERS & MANUFACTURING CHEMISTS,
MILES PLATTING, MANCHESTER.

BUYERS OF COAL TAR,
And Crude Products therefrom,
AMMONIACAL LIQUOR, &c.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

T. NEWBIGGING,
CONSULTING GAS ENGINEER,
5, NORFOLK STREET, MANCHESTER.

HENRY LYON,
ENGINEER,
AND
CONSULTING GAS ENGINEER,
BARTON HOUSE, opposite BARTON ARCADE,
DEANSGATE, MANCHESTER.

ALFRED LASS,
SPECIAL ACCOUNTANT FOR GAS COMPANIES,
30, GRACECHURCH STREET, LONDON.

Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.
The Forms of Account, which have been specially designed by A. L. to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.
The above forms are registered.
Water Companies Accounts also prepared and adjusted.
CONSULTATIONS.

JOHN ROMANS, C.E., F.G.S.E.,
CONSULTING GAS ENGINEER
AND
CANNEL COAL FACTOR,
30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.
GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

PATRONIZED BY THE ROYAL ARSENAL, WOOLWICH.

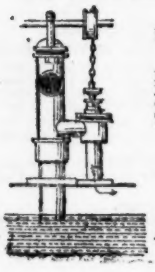
FERGUSON, Builder and Contractor. Kite method of Repairing Church Spires and High Chimneys. Chimneys straightened, pointed, and hooped. Old Chimneys pulled down by a process requiring no scaffolding or stoppage of work, by competent workmen, under personal supervision. For Lightning Conductors—cheapness and method of fixing—apply to C. R. FERGUSON, 12, Canal Road, MILE END.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

CATHELS'S Improved Retort-Settings. Guaranteed to heat and wear well, with great economy of Fuel.
Coloured lithograph copies of Working Drawings of Beds of One to Seven Retorts (so clearly arranged and fully shown as to be easily understood by any retort setter or bricklayer) having been made of these valuable settings, they can now be supplied with detailed Specification immediately on receipt of orders.
Apply to Mr. THOS. NEWBIGGING, Consulting Gas Engineer, 5, Norfolk Street, MANCHESTER.

COPP'S PATENT ANTI-DIP GAS APPARATUS.

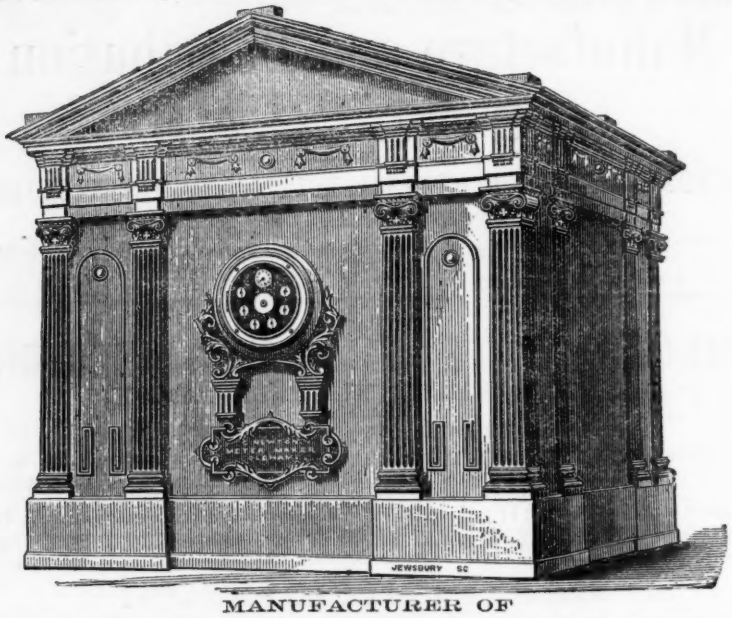


Produces from 10 to 20 per cent. more gas of higher illuminating power.
Prevents the deposit of carbon.
Retorts last much longer.
Charges work off quicker.
This simple invention has been in use in many works for the last six months, with the above results.

PRICE 2 GUINEAS EACH.

Testimonials and particulars on application.
Address **WALTER L. COPP,** WATCHET, SOMERSET.

GEORGE NEWTON,
UNION STREET WEST, OLDHAM,



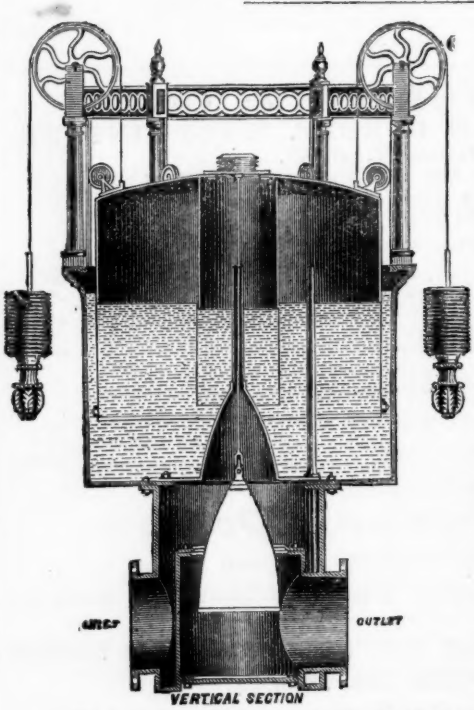
MANUFACTURER OF
SQUARE STATION-METERS, with PLANED JOINTS;
ROUND STATION-METERS, WITH CAST-IRON STANDS;
WET AND DRY CONSUMERS GAS-METERS, GOVERNORS, &c.

J. & J. BRADDOCK,
GLOBE METER-WORKS,
OLDHAM,

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

NOTICE OF REMOVAL.

D. BRUCE PEEBLES & CO.

Beg to announce that they have REMOVED to their New Premises,

TAY WORKS, BONNINGTON, EDINBURGH,

To which all communications should now be addressed.

May 30, 1877.

THE WIGAN COAL & IRON COMPANY,

LIMITED,

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN;

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

GAS PURIFICATION & CHEMICAL Co., LIMITED.

(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

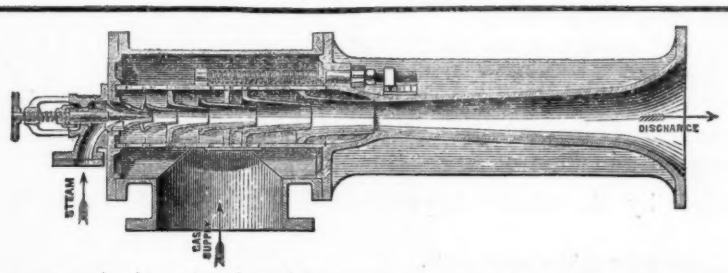
MANUFACTURERS OF

IMPROVED CENTRE-VALVES,

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



KÖRTING'S STEAM-JET GAS-EXHAUSTER.

IMPROVED CLELAND'S PATENT.

UPWARDS OF 250 IN USE.

CLELAND'S PATENT CONDENSER AND STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

KÖRTING BROS.,

17, LANCASTER AVENUE, MANCHESTER,

OR TO

GERALD J. TUPP, 8, John Street, Adelphi, W.C.,

LONDON,

SOLE AGENT FOR ENGLAND AND WALES.

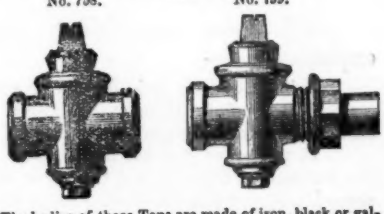
LAMBERT'S

CAST-IRON GAS-MAIN COCKS,

WITH PATENT WHITE METAL PLUGS.

TRADE (L) MARK.

No. 758. No. 759.



The bodies of these Taps are made of iron, black or galvanized, and the plugs of patent metal. They are warranted not to set fast or corrode, as do Iron or Brass Cocks; will always work easily; are strong, well made, durable; of little or no intrinsic value, and therefore not likely to be stolen; and the prices as stated below are (especially upon the larger sizes) fully 50 per cent. less than Brass Cocks.

	½	¾	1	1¼	1½	2-inch.
No. 758, with inside screws for iron pipe, black	2/0	3/0	4/4	6/6	7/6	12/0 each.
No. 759, with union on one end screwed inside for iron pipe, black	2/2	3/10	5/4	8/0	9/0	15/6 each.
Nos. 758 and 759, galvanized	0/3	0/4	0/6	0/8	0/10	1/4 extra.

MANUFACTORY:

SHORT STREET, LAMBETH, LONDON.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
SCOTSWOOD-ON-TYNE.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

THE TYNE COAL COMPANY, LIMITED, OWNERS.
W. RICHARDSON, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

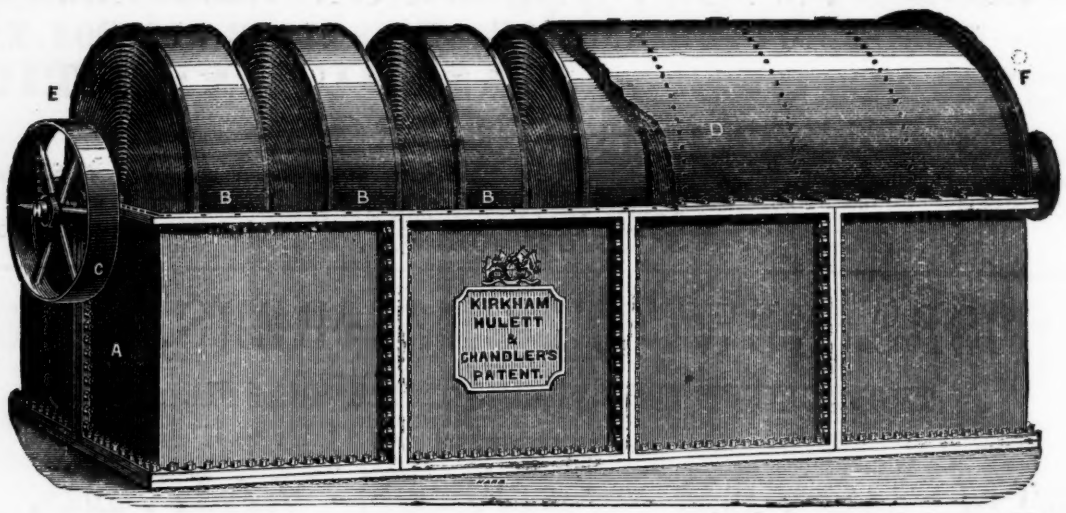
J. T. B. PORTER & CO.,
GAS ENGINEERS & MANUFACTURERS,
IRONFOUNDERS AND CONTRACTORS,
GOWTS BRIDGE WORKS,
LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.
REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

STANDARD WASHER AND SCRUBBER.



The advantages of the Apparatus will doubtless be understood by those interested in gas manufacture.

The principal points of any Apparatus for the extraction of ammonia may be summarily stated as follows: —

1. **A large amount of Surface is desirable.**
2. **Such Surface should be always effectually Wetted.**
3. **The Surfaces or Scrubbing Material should cause no Pressure.**
4. **The Gas should meet various strength Liquors on its course.**
5. **However small the quantity of Water used, it ought to operate over the whole Surface.**
6. **Changing Scrubbing Material is both Objectionable and Expensive.**
7. **Economy both as to Space occupied and Cost of Apparatus is an important item.**

All these requisitions are supplied by the above Apparatus, of which the following is an explanation:—

A is a cast-iron tank, formed into several separate water-tight compartments.

B B B volutes of sheet iron fitted to the centre shaft, which is driven by the pulley, C, and causing the said volutes to revolve each in a separate compartment filled with water or other fluid.

D, the cover, has partitions fitted into it corresponding with those in the tank, sufficient space being left between the top of the partition in the tank and the lower edge of that in the cover, to allow the gas a free passage through the first volute to the second, and so on to the third, fourth, &c.

The action is as follows:—The crude gas entering at E is partly washed in the first compartment, which becomes 10 or 12 oz. liquor, or stronger if required, according to the quantity allowed to enter per ton; the gas then passes to the second, where the liquor is of a less strength; thence into a weaker liquor, as it passes from one compartment to the other, finishing at the last compartment or outlet, F, with clean water, which is constantly flowing and running over from one compartment to another, until it reaches the last space, from which it flows from the outlet-pipe into the well or tank ready for sale or removal.

Taps are inserted in each compartment for the convenience of drawing liquor for testing, &c.

Applications as to Cost, &c., may be obtained of either

Mr. D. HULETT, 55 & 56, HIGH HOLBORN;
Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER;
Or Messrs. CHANDLER, 104, NEWINGTON CAUSEWAY.

Inquirers will please state their Maximum Day Make.

IMPROVED
COMPENSATING GAS-METER.
HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

COPIES OF REPORTS SENT ON APPLICATION.

MANUFACTURED BY

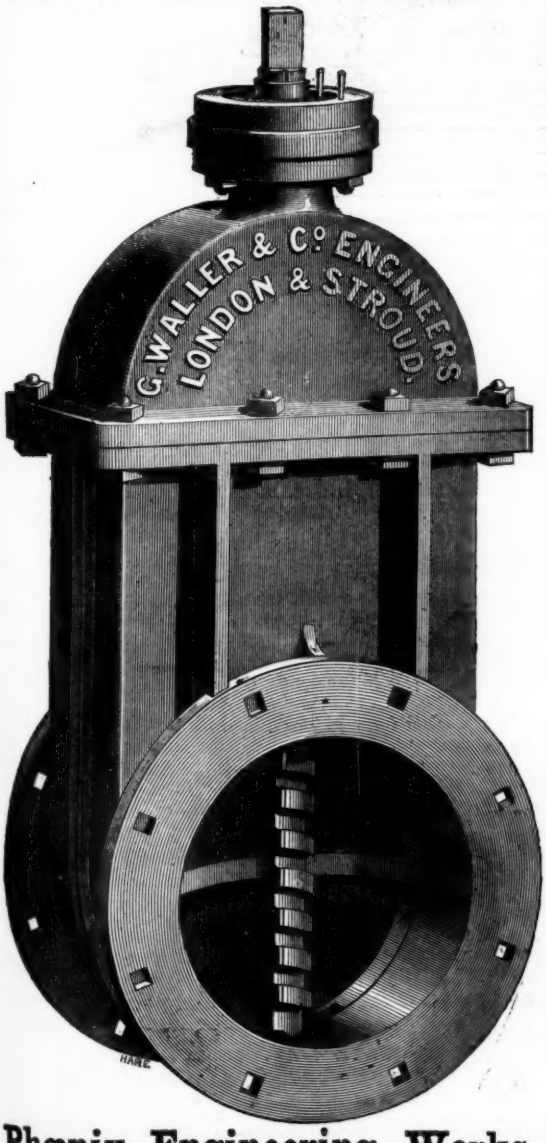
JOHN BENT & SON,

WET AND DRY GAS-METER AND GAS APPARATUS MANUFACTURERS,

BELL BARN ROAD, BIRMINGHAM.

Established 1830.

GEORGE WALLER & CO.,
GAS ENGINEERS AND CONTRACTORS.

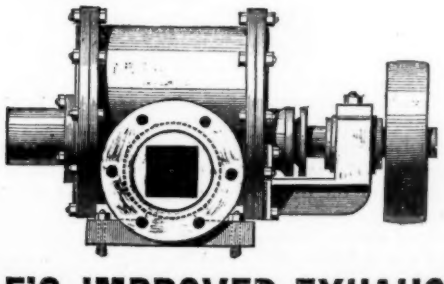


IMPROVED INDEX GAS-VALVE.

These Valves are constructed with Circular Wedged Backs, with the body *in one piece*, and are proved on both sides to 30 lbs. per square inch.

One man can open the largest Valve without gearing, and there are studs on the top of index which can readily be felt in the dark, to ascertain if the Valve is open or shut.

A large stock always on hand. Also good second-hand ones, removed during alterations and extensions of Gas-Works.



BEALE'S IMPROVED EXHAUSTER,

WITH OUTER BEARING.

Specially made by G. W. & Co. to supersede the old style of driving by counter-shaft.

Phœnix Engineering Works, Holland Street, Southwark, S.E.

EDWARD COCKEY & SONS,

GAS ENGINEERS, FROME SELWOOD,

MANUFACTURERS OF ALL DESCRIPTIONS OF

APPARATUS CONNECTED WITH GAS-WORKS.

THE ORIGINAL PATENTEES AND MANUFACTURERS OF THE

DRY-FACED VALVES

FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

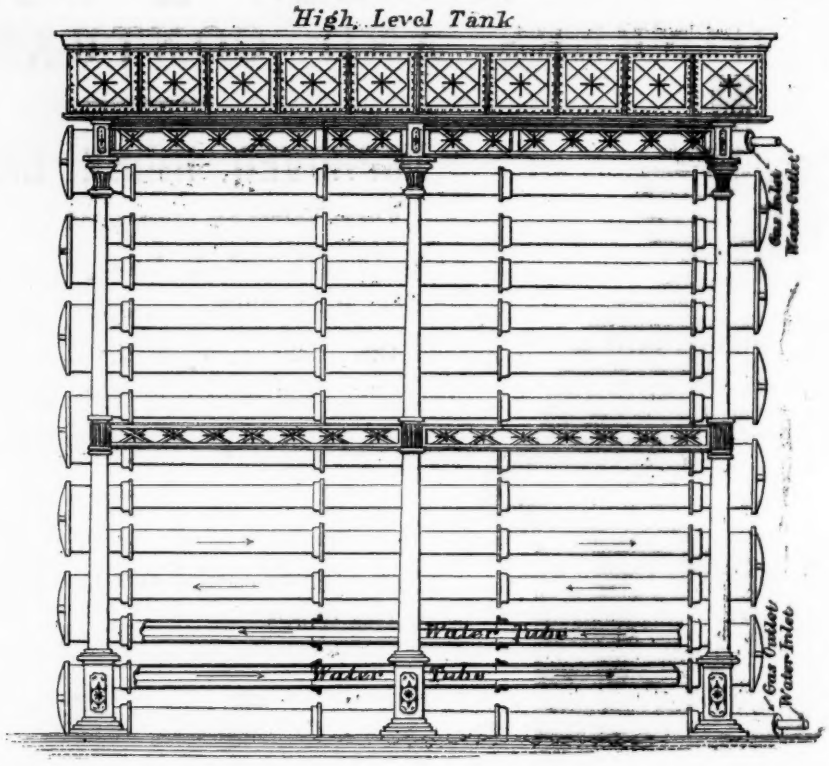
The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

MORRIS & CUTLER'S PATENT CONDENSER.



The Condenser may consist of pipes arranged in tiers as shown, or in any other form most convenient to the site available, each tier being connected with special connexions, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet.

The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. (The Condenser itself may form the support for a high-level cistern as illustrated.) By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control.

The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to

Mr. F. MORRIS, GAS-WORKS, BRENTFORD,

OR TO

S. CUTLER & SONS,

ENGINEERS, IRONFOUNDERS, AND CONTRACTORS FOR GAS AND WATER-WORKS,

MILLWALL, E.

JOHN ABBOT AND CO.,

LIMITED,

IRON AND BRASS FOUNDERS,

PARK WORKS, GATESHEAD-ON-TYNE.

London Office: 2, SUFFOLK LANE, CANNON STREET.

Glasgow Office: 54, ST. ENOCH'S SQUARE.

MANUFACTURERS OF ALL DESCRIPTIONS OF

HYDRAULIC MACHINERY,

INCLUDING

ACCUMULATORS, FORCE-PUMPS, CRANES, & LIFTS,

FOR

GAS-WORKS, WAREHOUSES, &c.

IMPROVED HYDRAULIC MACHINERY,

Specially Arranged for Lifting and Lowering Purifier-Covers, &c.

MAKERS OF

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS;

PIPES FOR GAS AND WATER WORKS;

ROOFS, COLUMNS, AND GIRDERS.

DESIGNS AND ESTIMATES SUPPLIED ON APPLICATION.

THOMAS ALLAN & SONS,

IRONFOUNDERS,

WORKS:

SPRINGBANK FOUNDRY & NORTH WOODSIDE FOUNDRY,

GLASGOW;

BONLEA FOUNDRY, STOCKTON-ON-TEES,

Manufacturers of

CAST-IRON GAS AND WATER PIPES.

SIZES: ¾ to 12 inches at GLASGOW.

„ 1½ to 7 „ STOCKTON.

A LARGE STOCK KEPT, AND PRICES MODERATE.

Freight to London, in the Stream, 10s. per ton from Stockton; 12s. 6d. from Glasgow.

London Agent: Mr. A. C. FRASER, ST. STEPHEN'S CHAMBERS, TELEGRAPH STREET.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, the number in use exceeds **one hundred,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

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WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS

TO GAS COMPANIES AND THE TRADE.

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CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.

A LARGE STOCK ALWAYS IN HAND OF

IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,

AND EVERY DESCRIPTION OF

GAS AND WATER FITTINGS.

THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.

STREET LAMPS AND COLUMNS IN GREAT VARIETY.

WORKS: LONDON AND BIRMINGHAM.

GAS MOONS, Cut and Engraved, of the newest designs

GAS REFLECTORS In Silver and Glass

GAS NIBS AND **BURNERS** Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1876, are now complete.

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ESTABLISHED 1830.

LESMAHAGOW CANNEL COAL.

FERRAND DAVIES,

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SOLE AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL.

Quotation and Analysis forwarded on application.

G. J. EVESON,

GAS COAL AND CANNEL FACTOR,

Has on offer, in quantities to suit purchasers, Best Wigan Arley Mine, Orrell Screened and Unscreened Gas Coal and Nuts; Best Yorkshire, Real Old Silkstone, Derbyshire, and North Staffordshire Screened and Unscreened Gas Coal and Nuts; also Best Lancashire, Yorkshire, Derbyshire, and other Cannel, as supplied to some of the principal Gas Companies in England, to whom references are permitted.

Analysis and Prices forwarded on application to

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N.B.—Gas Managers will oblige by advising when they will be prepared to receive Tenders.

STOURBRIDGE FIRE-BRICKS, RETORTS, CLAY, &c.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

173, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12¼ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

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The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

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CANNEL COAL MERCHANT,

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Established 1840.

WILSON CARTER & PEARSON,

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Supply to any Railway Station or export Best Wigan Arley Gas Coal and Nuts; best qualities of the Derbyshire, Yorkshire, and North Staffordshire Gas Coals and Nuts; also the best descriptions of Lancashire, Welsh, Scotch, and other Cannel.

Messrs. WILSON CARTER & PEARSON, being contractors to several of the principal Gas Companies in the Midland Counties, have pleasure in being enabled to give them as references.

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GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD, LANCASHIRE.

ALBERT GAS COAL.

THE DERBYSHIRE

SILKSTONE COAL COMPANY,

LIMITED,

CAN OFFER A

GAS COAL

Of superior quality, delivered in trucks at any Railway Station in England, or shipped on board at Hull, Grimsby Docks, or Barrow-in-Furness.

Purified gas per ton of coal in cubic feet (average)	**10,262**
Illuminating power in candles	**15·86**
Weight of coke in lbs. per ton of coal	**1,502**

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

WEST'S GAS IMPROVEMENT COMPANY,

LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

SILKSTONE GAS COAL

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LANCASHIRE AND MIDLAND CANNEL.

EMOR G. WRIGLEY, Merchant,

Having made arrangements with four large Collieries for the exclusive sale of their GAS COAL and CANNEL, can offer to Gas Companies large quantities, for delivery over one or two years, at exceedingly low prices. His REAL OLD SILKSTONE GAS COAL will give, in regular work, 10,200 feet 16·6 candle gas and 13 cwt. superior coke; and a WIGAN CANNEL 11,375 feet 21·75 candle gas and 12 cwt. superior coke.

PRICES AND ANALYSIS WILL BE FORWARDED TO ANY PART ON APPLICATION TO THE CHIEF OFFICE,

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1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

CLASS II.

This Paint having been in general use over fifteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

Warrington Gaslight and Coke Company,
Offices, Mersey Street, Warrington, April 23, 1877.

Messrs. NEWTON, CHAMBERS, AND CO.,

Gentlemen,

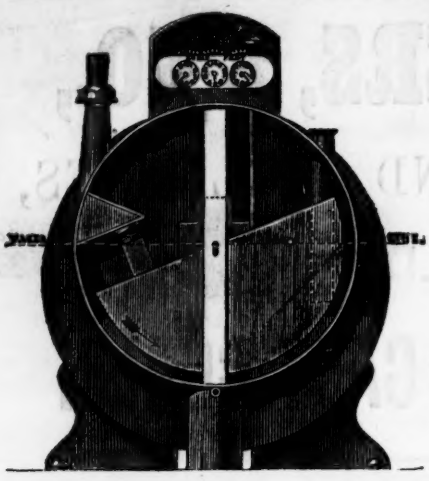
After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

The average of Nine samples gives a yield of 12,500 cubic feet of 15¼ Candle Gas, being equivalent to 664 lbs. of sperm per ton, and 1420 lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

Yours truly,

JAMES PATERSON.

Full particulars will be sent on application to us—address as above.



THE

UNVARYING WATER-LINE GAS-METER.

(SANDERS AND DONOVAN'S PATENT.)

"Unquestionably the best Water Gas-Meter now in use."—THOS. G. BARLOW, C.E.

Over 120,000 in action.

MANUFACTURERS:

THE GAS-METER COMPANY, LIMITED,

KINGSLAND ROAD, LONDON;

WITH

Branch Manufactories at DUBLIN and OLDHAM.

HARRIS & PEARSON,

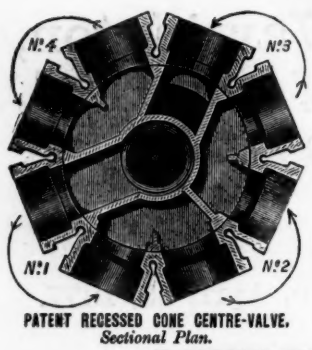
FIRE-CLAY AND BRICK WORKS, STOURBRIDGE.

GAS-RETORTS, LUMPS, TILES, & FIRE-BRICKS,

OF EVERY DESCRIPTION.

A LARGE ASSORTMENT OF GAS-RETORTS IN STOCK.

STOCK FOR EXPORT READY AT THE WORKS, AND AT ELLESMERE PORT.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Plan.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW,

SOLE MAKERS OF

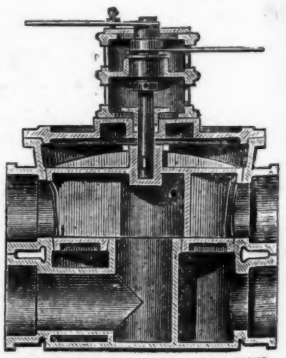
PATENT

RECESSED CONE CENTRE-VALVES,

Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Elevation.

LONDON OFFICE: 106, CANNON STREET.

D. HULETT & CO.

Invite the attention of Gas Companies, Corporations, and others to their

PATENT STREET LAMPS,

Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

PRICE 10s. each, net. Special quotations for large quantities.
Also made EXTRA STOUT recommended for its durability, PRICE 11s. 6d. each.

D. HULETT'S IMPROVED SERVICE CLEANSER,

By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

HULETT'S PATENT MERCURIAL REGULATOR,

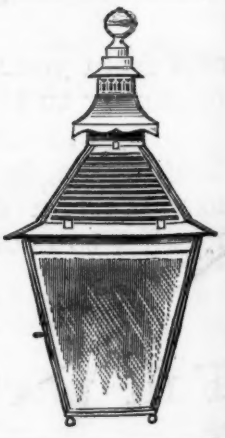
For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

PATENTEES OF IMPROVED WET AND DRY GAS-METERS.

Makers of all kinds of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.

GAS HEATING AND COOKING STOVES.

55 and 56, HIGH HOLBORN, LONDON.



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